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ABSTRACT

Compiled in this document are several reports emanating from the United Nations Conference on the Human Environment, Stockholm, June 5-16, 1972. Included are (1) Provisional Agenda, (2) Annotations to the Provisional Agenda, (3) Provisional Rules of Procedure, (4) Draft Declaration on the Human Environment, (5) Planning and Management of Human Settlements for Environmental Quality (subject area I), (6) Environmental Aspects of Natural Resources Management (subject area II), (7) Identification and Control of Pollutants of Broad International Significance (subject area III), (8) an addendum to subject area III, Draft Articles of a Convention on Ocean Dumping, (9) Educational, Informational, Social and Cultural Aspects of Environmental Issues (subject area IV), (10) Development and Environment (subject area V), (11) International Organizational Implications of Action Proposals (subject area VI), (12) an addendum to subject area VI, Views of the Preparatory Committee for the Conference, (13) The UN System and the Human Environment, a consolidated document submitted by the Administrative Committee on Coordination, (14) Conference Bibliography, (15) Information on Conference Documents, (16) Recommendations for Action (recommendations for international action, proposed recommendations for national action, and how proposed recommendations address needs), and (17) a List of Abbreviations used in Official Conference documents. (BL)

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# United Nations
# Conference on the human environment

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## Provisional agenda

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# GENERAL ASSEMBLY

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CONFERENCE ON THE
HUMAN ENVIRONMENT

Stockholm, 5-16 June 1972

Provisional agenda item 7

## ADOPTION OF THE AGENDA

### Note by the Secretary-General

The provisional agenda for the Conference contained in this document was formulated by the Secretary-General, on the basis of the recommendations of the Preparatory Committee for the Conference, and was approved by the General Assembly at its twenty-sixth session in its resolution 2850(XXVI).[1] The provisional agenda is hereby submitted for adoption by the Conference.

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[1] General Assembly resolution 2850(XXVI) of 20 December 1971, operative paragraph 1

## Provisional agenda for the Conference

1. Opening of the Conference.
2. Election of the President.
3. Adoption of the rules of procedure.
4. Constitution of committees.
5. Election of the officers other than the President.
6. Credentials of representatives to the Conference:
    (a) Appointment of the credentials committee;
    (b) Report of the credentials committee.
7. Adoption of the agenda.
8. General debate.
9. Declaration on the Human Environment.
10. Planning and management of human settlements for environmental quality (subject area I).
11. Environmental aspects of natural resources management (subject area II).
12. Identification and control of pollutants of broad international significance (subject area III).
13. Educational, informational, social and cultural aspects of environmental issues (subject area IV).
14. Development and environment (subject area V).
15. International organizational implications of action proposals (subject area VI).
16. Adoption of plan of action.
17. Adoption of the report of the Conference.

A/CONF. 48/2

# United Nations
# Conference on the human environment

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# Annotations
# to the provisional agenda

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CONFERENCE ON THE HUMAN ENVIRONMENT
Stockholm, 5-16 June 1972

Provisional agenda item 7

# ADOPTION OF THE AGENDA

## Annotations to the provisional agenda and suggestions on the organization of the work of the Conference

### Note by the Secretary-General

The annotations to the provisional agenda for the Conference contained in Part I of this document are intended to facilitate the adoption of the agenda and the conduct of the proceedings of the Conference. Part II of this document contains suggestions concerning the organization of the work of the Conference, including a tentative schedule of meetings. These annotations and suggestions are based on the provisional rules of procedure for the Conference approved by the General Assembly (A/CONF.48/3), on the suggestions for the organization of work of the Conference endorsed by the Preparatory Committee at its fourth session (A/CONF.48/PC.17, Chapter V) and on past practice in United Nations conferences.

Further information concerning the proceedings of the Conference may be made available to participants in the pre-Conference meeting starting on 31 May 1972 at the Old Parliament Building, Stockholm.

## I. ANNOTATIONS TO THE PROVISIONAL AGENDA

Item 1: Opening of the Conference

The United Nations Conference on the Human Environment will be declared open by the Secretary-General of the United Nations on Monday 5 June 1972 at 3 p.m. at Folkets Hus, Stockholm. The welcoming ceremony organized by the host Government will have taken place earlier that day at the Royal Opera House, Stockholm, starting at 11 a.m.

Item 2: Election of the President

Rule 6 of the draft rules of procedure provides *inter alia* that the Conference shall elect a President and rule 40 provides that all elections shall be held by secret ballot unless otherwise decided by the Conference. It should be noted however that, in drawing up these rules, the Preparatory Committee for the Conference expressed the hope that elections by secret ballot could be dispensed with and that agreement upon the officers to be elected could be reached before the Conference through informal consultations.1/

It is customary for the President of a United Nations conference held at a site other than a United Nations Office to be a representative of the host country. The Conference may therefore wish to elect as its President the head of the delegation of Sweden.

Item 3: Adoption of the rules of procedure

The draft rules of procedure for the Conference are contained in document A/CONF.48/3. They were drawn up by the Preparatory Committee at its third session. By resolution 2850(XXVI) of 20 December 1971, the General Assembly approved the draft rules and recommended them for adoption by the Conference.

Item 4: Constitution of Committees

Rule 44 of the draft rules of procedure provides that the Conference shall establish three main Committees for the performance of its functions. It has been agreed by the Preparatory Committee2/ that items 10 to 15 of the provisional agenda should be allocated to these Committees (see annotations to items 10 to 15 below).

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1/ A/CONF.48/PC/13, para. 181

2/ A/CONF.48/PC/9, para. 92; see also A/CONF.48/PC/15, paras. 115-116

The Preparatory Committee at its fourth session agreed that it might be necessary to set up a working group of the Conference on the declaration on the human environment, which could if necessary consider editorial suggestions and any proposed substantive changes in relation to the draft declaration.[1/] The membership of such a working group would be open to all States participating in the Conference.

Item 5: Election of officers other than the President

Rule 6 of the draft rules of procedure provides that the Conference shall elect, in addition to the President, three Vice-Presidents and the Rapporteur of the Conference and the Chairman, Vice-Chairman and Rapporteur of each of the three main Committees. These officers together with the President shall constitute the Bureau of the Conference (rule 12). The reference in the annotation to item 2 above concerning the waiver of a secret ballot applies equally to the election of officers other than the President.

If the Conference decides to establish a working group on the declaration on the human environment, it should also elect the officers of that body. It may be appropriate for such a working group to have the same number of officers as a main Committee, namely, a Chairman, a Vice-Chairman and a Rapporteur.

In the election of officers, due account should be taken of the need to ensure an equitable geographical distribution.

In order to expedite the process of election and in conformity with the recent practice of the General Assembly, it is suggested that statements nominating candidates be limited to one for each candidate, after which the Conference should proceed to elections immediately. It would be even more expeditious if a single slate of candidates could be put forward for election. It is further suggested that, following the election of officers, only one statement be made, on behalf of the entire membership of the Conference, congratulating all the officers on their election.

Item 6: Credentials of representatives to the Conference

(a) Appointment of the Credentials Committee

Rule 4 of the draft rules of procedure provides that a Credentials Committee shall be appointed at the beginning of the Conference and that its

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[1/] A/CONF.48/PC/17, paras. 90-91 and 81-82 composition shall be the same as that of the Credentials Committee of the General Assembly at its twenty-sixth session, namely: Australia, Colombia, France, Ireland, Liberia, Mongolia, Somalia, the Union of Soviet Socialist Republics and the United States of America.

(b) Report of the Credentials Committee

In accordance with Rule 4 of the draft rules of procedure, the Credentials Committee shall examine the credentials of representatives and report to the Conference without delay. Rule 3 provides that the credentials of representatives and the names of alternate representatives and advisers shall be submitted to the Secretary-General of the Conference, if possible not less than one week before the date fixed for the opening of the Conference[1]. The credentials shall be issued by the Head of State or Government or by the Minister for Foreign Affairs.

Item 7: Adoption of the agenda

The provisional agenda for the Conference is contained in document A/CONF.48/1. It was formulated by the Secretary-General on the basis of the recommendations of the Preparatory Committee, and was approved by the General Assembly by its resolution 2850(XXVI) of 20 December 1971.

After the adoption of the agenda and before proceeding to the next item of business, the Conference may wish to consider the suggestions for the organization of its work, including the tentative schedule of meetings, contained in Part II of the present document and any further suggestions which may be made nearer the time of the Conference.

Item 8: General debate

The general debate is intended to provide an opportunity for the heads of delegations to make general policy statements at plenary meetings covering all subject areas on the Conference agenda. Delegations may wish to address themselves *inter alia* to the draft declaration on the human environment (A/CONF.48/4) and to the proposed action plan for the human environment (A/CONF.48/5).

Pressure of time precludes general discussion in the main Committees, the work of which will be limited to the consideration and approval of specific recommendations for action at the international level. Accordingly, delegates may also wish to include in their statements in plenary any general comments on the agenda items that will be dealt with in the Committees.

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[1] By a note dated 14 February 1972, the Secretary-General of the United Nations requested Governments to communicate the names of their representatives, alternate representatives and advisers to the Secretary-General of the Conference by 10 April 1972.

It is expected that the heads of delegations who will participate in the general debate will be of senior ministerial rank. In order to enable them to plan their participation in the Conference and to make maximum use of the short time available for the general debate, it is the intention of the Conference secretariat to draw up a list of speakers in advance of the Conference. In this connexion, attention is drawn to the letter dated 19 April 1972 from the Secretary-General of the Conference to Ministers for Foreign Affairs of participating States, in Section C of which Governments are requested to suggest alternative dates and times at which their delegations would wish to participate in the general debate. Attention is also drawn to the suggestion,[1/] which was endorsed by the Preparatory Committee, that it will be necessary to set a time limit of 15 to 20 minutes on statements by government representatives, and a somewhat shorter limit (say 10 minutes) for statements by other participants and observers.

The Secretary-General of the Conference intends to make a statement opening the general debate at the first plenary meeting of the Conference on Monday, 5 June. Statements by delegations in the general debate will commence on the morning of Tuesday, 6 June at 10 a.m. The general debate will be closed at the conclusion of the afternoon meeting on Monday, 12 June. The list of speakers, however, will be closed in the first days of the Conference. It should be noted that it is hoped to accommodate all participants who wish to speak in the general debate without having recourse to evening or weekend meetings; this will only be possible if the suggested time limits on statements are strictly respected.

Item 9: Declaration on the Human Environment

Work on the preparation of a draft declaration on the human environment has been undertaken by an Intergovernmental Working Group on the Declaration established in accordance with a recommendation of the Preparatory Committee at its second session.[2/] The Intergovernmental Working Group held two substantive sessions

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[1/] A/CONF.48/PC/17, para. 87

[2/] A/CONF.48/PC/9, para. 28

(10-21 May 1971 and 5-14 January 1972), the reports on which (A/CONF.48/PC/12 and 16) contain drafts of the preamble and principles of a declaration and were considered in turn by the Preparatory Committee at its third and fourth sessions.[1] At its fourth session,[2] the Preparatory Committee agreed that the draft preamble and principles of the declaration on the human environment, as contained in Annex III to the report of the Intergovernmental Working Group on the Declaration on its second session, should be forwarded to the Conference for its consideration and appropriate action. It was understood that the agreement to forward this text to the Conference did not imply any expression of approval or disapporval thereof on the part of the Preparatory Committee. The text is contained in document A/CONF.48/4.

It has been suggested that it might be appropriate for delegates to address themselves to the subject of the draft declaration in their statements in the general debate (see annotation to item 8 above). Attention is also drawn to the possibility that the draft declaration may be submitted to a working group of the Conference for any more detailed consideration which might be necessary before being taken up at a plenary meeting (see annotation to item 4 above). The tentative schedule of meetings provides for the formal adoption of a declaration on the human environment on the last day of the Conference.

Item 10: Planning and management of human settlements for environmental quality (subject area I)

Item 11: Environmental aspects of natural resources management (subject area II)

Item 12: Identification and control of pollutants of broad international significance (subject area III)

Item 13: Educational, informational, social and cultural aspects of environmental issues (subject area IV)

Item 14: Development and environment (subject area V)

Item 15: International organizational implications of action proposals (subject area VI)

As was stated in the annotation to item 4 above, the Preparatory Committee agreed that items 10 to 15 of the provisional agenda should be allocated to the three main Committees of the Conference as follows (documents so far issued relating to each item are also indicated):

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[1] A/CONF.48/PC/13, Chapter VII and A/CONF.48/PC/17, Chapter IV

[2] A/CONF.48/PC/17, para. 83

First Committee

item 10 (document A/CONF.48/6)

item 13 (document A/CONF.48/9)

Second Committee

item 11 (document A/CONF.48/7)

item 14 (document A/CONF.48/10)

Third Committee

item 12 (document A/CONF.48/8 and Add.1)

item 15 (documents A/CONF.48/11, A/CONF.48/11/Add.1, A/CONF.48/12)

It is essential that the Committees conclude their work promptly so that their reports may be submitted to the Conference in plenary meeting and the resulting action by the Conference be reflected in the action plan and report which the Conference should adopt on its concluding day. Accordingly, attention is again drawn to the fact that the constraints imposed by the time which is available to the Committees exclude general debates on the subjects before each Committee. The work of the Committees must be centred on the examination and approval of recommendations for international action.

Those recommendations which are approved by the Committees will form the body of the Committee reports which will be submitted to plenary. The Committee reports will not give an account of the discussion leading to the approval of recommendations.1/

It should be recalled that the Conference is not expected to examine in detail the recommendations for action at the national level; such recommendations are intended to be referred by the Conference to governments for their consideration and such action as they may deem appropriate.

Item 16: Adoption of the plan of action

By the last day of the Conference, Friday, 16 June, it is expected that the Conference will have considered the reports of the main Committees and taken action on the recommendations contained therein. The Conference will then proceed to the

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1/ However, the report of the Conference will include a summary of the main views expressed in the general debate in plenary (see Annex II).

formal adoption of its action plan for the human environment. The action plan will consist of the recommendations for international action arranged according to the action plan framework.[1] If the recommendations approved by Committees are already arranged according to the action plan framework in the Committee reports, this will facilitate the adoption of the action plan by the Conference.

Item 17: Adoption of the report of the Conference

The report of the Conference will be prepared according to the outline which was circulated to the Preparatory Committee at its fourth session and which is annexed to the present document (Annex II).

It may prove impossible to complete the full text of the report in time for it to be adopted as a whole by the Conference. In that event, the Conference would adopt the principal elements of the report, including the precise texts of the recommendations for international action, and would authorize the Rapporteur to complete and edit the final text after the conclusion of the Conference.

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[1] See document A/CONF.48/5 for an explanation of the framework. Document A/CONF.48/INF.2 illustrates the possible form of the proposed action plan arranged in the framework.

## II. SUGGESTIONS ON THE ORGANIZATION OF THE WORK OF THE CONFERENCE[1]

The suggestions which follow below are intended to assist delegations in planning their participation in the work of the Conference. They are largely based on ideas put forward in the Preparatory Committee at its fourth session and on the comments which members of the Committee expressed thereon.[2]

It should be emphasized that the limited duration of the Conference[3] does not permit any margin of error with regard to its timetable. The completion of the work of the Conference will call for unprecedented efforts from all participants. The proceedings of the Conference and its Committees will have to be conducted with utmost despatch, efficiency and discipline.

The submission of Committee reports to plenary will have to be staggered so that the process of translation, reproduction and distribution can be completed in time to ensure a smooth flow of work for the plenary during its final phase. To this end, Committee reports should be transmitted to plenary in two parts, each covering one of the two agenda items allocated to each Committee. Considerations of timing should also dictate the order in which Committees consider their items. For example, it would seem advisable for the First Committee to take up item 13 (subject area IV) before item 10 (subject area I), as it is likely that the former item may be more quickly completed and the relevant part of the Committee's report submitted for processing by the middle of the first week.

The limitations on time imposed by the translation and reproduction process require the First and Second Committees to complete their work, except for the adoption of their reports, in the four available working days of the first week of the Conference. The work of the Third Committee will have to continue into Monday of the second week, since conclusions on item 15, "International organizational implications of action proposals", cannot be reached before work on the other substantive agenda items has been completed.

Meetings will normally take place from 10 a.m. to 1 p.m. and from 3 p.m. to 6 p.m. No meetings are scheduled for Saturday 10 June and Sunday, 11 June except for one meeting of the Third Committee on Saturday morning to enable that

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[1] See also annotation to item 8 above.

[2] A/CONF.48/PC/17, Chapter V

[3] The decision to limit the Conference to two weeks' duration was taken by the General Assembly at its twenty-fourth session (resolution 2581(XXIV) of 15 December 1969)

Committee to expedite its work on item 15. Week-day evenings and the mid-Conference weekend will have to be used for consultations and the preparation of reports.

Should it be decided to establish a working group of the Conference on the declaration, it would be necessary for the group to produce a final draft of the declaration by the end of the first week, so that it might be considered in plenary on the Tuesday of the second week.

The tentative schedule of meetings prepared by the secretariat on the basis of the suggestions which appear above is contained in Annex I.

## Annex I

## Tentative schedule of meetings for the Conference[a/] and its main Committees

| Stockholm, 5-16 June 1972 | | Mon. 5 | Tue. 6 | Wed. 7 | Thu. 8 | Fri. 9 | Sat. 10 | Sun. 11 | Mon. 12 | Tue. 13 | Wed. 14 | Thu. 15 | Fri. 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Plenary | a.m. | (Welcoming Ceremony) | GD | GD | GD | GD | | | GD | Decl. | Report SA IV | Reports SA II, III | Adoption of Decl., AP and Report |
| | p.m. | Opening, Elections, Organization of work | GD | GD | GD | GD | | | GD | Decl. | Reports SA I,V | Report SA VI | |
| First Committee | a.m. | | SA IV | SA IV | SA I | SA I | | | Report SA IV | Report SA I | | | |
| | p.m. | | SA IV | SA I | SA I | SA I | | | | | | | |
| Second Committee | a.m. | | SA V | SA V | SA II | SA II | | | Report SA V | | Report SA II | | |
| | p.m. | | SA V | SA V | SA II | SA II | | | | | | | |
| Third Committee | a.m. | | SA III | SA III | SA III | SA VI | SA VI | | SA VI | Report SA III | | | |
| | p.m. | | SA III | SA III | SA III | SA VI | | | | | Report SA VI | | |

a/ Abbreviations used:
GD = general discussion
Decl. = Declaration on the Human Environment
AP = action plan
SA = subject area

## Annex II

## Draft outline of Conference report

First Part: INTRODUCTION

Background of the Conference and preparatory process

Second Part: ACTION BY THE CONFERENCE

A. Declaration on the Human Environment

B. Action Plan

(i) Framework

(ii) Recommendations for international action

C. Institutional and funding arrangements

D. Referral to Governments of recommendations for national action.

Third Part: CONFERENCE PROCEEDINGS

A. Organizational matters and opening of the Conference

B. Brief summary of plenary

C. Action on Committee reports

D. Adoption of Conference report

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E. Recommendations for national action

A/CONF. 48/3

# United Nations
# Conference on the human environment

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# Provisional rules of procedure

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CONFERENCE ON THE
HUMAN ENVIRONMENT

Stockholm, 5-16 June 1972

Provisional agenda item 3

## ADOPTION OF RULES OF PROCEDURE

### Note by the Secretary-General

The draft rules of procedure for the Conference contained in this document were drawn up by the Preparatory Committee at its third session.[1] At its twenty-sixth session, the General Assembly, by its resolution 2850 (XXVI), approved the draft rules and recommended them for adoption by the Conference.[2]

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[1] A/CONF.48/PC/13, chapter X.B.

[2] General Assembly resolution 2850 (XXVI) of 20 December 1971, operative paragraph 2.

## Draft rules of procedure for the Conference

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## I. REPRESENTATION AND CREDENTIALS

### Composition of delegations

### Rule 1

The delegation of each State participating in the Conference shall consist of one head of delegation and no more than five accredited representatives and such alternate representatives and advisers as may be required.

### Alternates or advisers

### Rule 2

An alternate representative or an adviser may act as a representative upon designation by the head of delegation.

### Submission of credentials

### Rule 3

The credentials of representatives and the names of alternate representatives and advisers shall be submitted to the Secretary-General of the Conference, if possible not less than one week before the date fixed for the opening of the Conference. Credentials shall be issued either by the Head of State or Government or by the Minister for Foreign Affairs.

### Credentials Committee

### Rule 4

A Credentials Committee shall be appointed at the beginning of the Conference. Its composition shall be the same as that of the Credentials Committee of the General Assembly at its twenty-sixth session. It shall examine the credentials of representatives and report to the Conference without delay.

### Provisional participation in the Conference

### Rule 5

Pending a decision of the Conference upon their credentials, representatives shall be entitled to participate provisionally in the Conference.

## II. OFFICERS

### Election

### Rule 6

The Conference shall elect the following officers: the President of the Conference, three Vice-Presidents and the Rapporteur of the Conference, and the Chairman, Vice-Chairman and Rapporteur of each of the three main committees provided for in rule 44.

### President

Rule 7

The President shall be responsible for the general conduct of business in the plenary meetings of the Conference.

Rule 8

The President, in the exercise of his functions, remains under the authority of the Conference.

### Acting President

Rule 9

If the President is absent from a meeting or any part thereof, he shall designate a Vice-President to take his place.

Rule 10

A Vice-President acting as President shall have the same powers and duties as the President.

### The President shall not vote

Rule 11

The President, or Vice-President acting as President, shall not vote, but shall appoint another member of his delegation to vote in his place.

## III. BUREAU OF THE CONFERENCE

### Composition

Rule 12

The officers listed in rule 6 shall constitute the Bureau of the Conference.

### Functions

Rule 13

The Bureau shall assist the President in the general conduct of the business of the Conference and, subject to the decisions of the Conference, shall ensure the co-ordination of its work.

## IV. CONFERENCE SECRETARIAT

### Duties of the Secretary-General of the Conference

Rule 14

The Secretary-General of the Conference, or his representative, shall act in that capacity in all meetings of the Conference and its committees.

### Rule 15

The Secretary-General of the Conference shall be responsible for translating, reproducing and distributing the official documents, reports and resolutions of the Conference and its committees: interpreting speeches made at the meetings; keeping sound records of the public meetings of the Conference and its three main committees; having the custody and preservation of the documents in the archives of the United Nations; publishing the report of the Conference; and, generally, performing all other work which the Conference may require.

### Rule 16

The Secretary-General of the Conference, or his representative, may make statements concerning any question under consideration.

## V. CONDUCT OF BUSINESS

### Quorum

### Rule 17

A quorum shall be constituted by the representatives of a majority of the States participating in the Conference.

### General powers of the President

### Rule 18

In addition to exercising the powers conferred upon him elsewhere by these rules, the President shall declare the opening and closing of each plenary meeting of the Conference, direct the discussions at such meetings; accord the right to speak; put questions to the vote and announce decisions. He shall rule on points of order and, subject to these rules of procedure, have complete control of the proceedings and over the maintenance of order thereat. The President may propose to the Conference the limitation of time to be allowed to speakers, the limitation of the number of times each representative may speak on any question, the closure of the list of speakers or the closure of the debate. He may also propose the suspension or the adjournment of the debate on any question under discussion.

### Speeches

### Rule 19

No person may address the Conference without having previously obtained the permission of the President. Subject to rules 20 and 21, the President shall call upon speakers in the order in which they signify their desire to speak. The President may call a speaker to order if his remarks are not relevant to the subject under discussion.

### Precedence

### Rule 20

The Chairman or Rapporteur of a committee may be accorded precedence for the purpose of explaining the conclusion arrived at by his committee.

### Points of order

### Rule 21

During the discussion of any matter, a representative may rise to a point of order, and the point of order shall be immediately decided by the President in accordance with the rules of procedure. A representative may appeal against the ruling of the President. The appeal shall be immediately put to the vote and the President's ruling shall stand unless overruled by a majority of the representatives present and voting. A representative rising to a point of order may not speak on the substance of the matter under discussion.

### Time-limit on speeches

### Rule 22

The conference may limit the time to be allowed to each speaker and the number of times each representative may speak on any question. When the debate is limited and a representative has spoken his allotted time, the President shall call him to order without delay.

### Closing of list of speakers

### Rule 23

During the course of a debate the President may announce the list of speakers and, with the consent of the Conference, declare the list closed. He may, however, accord the right of reply to any representative if a speech delivered after he has declared the list closed makes this desirable.

### Adjournment of debate

### Rule 24

During the discussion of any matter, a representative may move the adjournment of the debate on the question under discussion. In addition to the proposer of the motion, one representative may speak in favour of, and one against, the motion, after which the motion shall immediately be put to the vote.

## Closure of debate

### Rule 25

A representative may at any time move the closure of the debate on the question under discussion, whether or not any other representative has signified his wish to speak. Permission to speak on the closure of the debate shall be accorded only to two speakers opposing the closure, after which the motion shall immediately be put to the vote. If the Conference is in favour of the closure, the President shall declare the closure of the debate.

## Suspension or adjourment of the meeting

### Rule 26

During the discussion of any matter, a representative may move the suspension or the adjournment of the meeting. Such motion shall not be debated, but shall immediately be put to the vote.

## Order of procedural motions

### Rule 27

Subject to rule 21, the following motions shall have precedence in the following order over all other proposals or motions before the meeting:

(a) To suspend the meeting;
(b) To adjourn the meeting;
(c) To adjourn the debate on the question under discussion;
(d) To close the debate on the question under discussion.

## Proposals and amendments

### Rule 28

Proposals and amendments before the meeting shall normally be prepared in writing and presented to the Secretary-General of the Conference, who shall circulate copies to the delegations. As a general rule, no proposal shall be discussed or put to the vote at any meeting of the Conference unless copies of it have been circulated in all working languages to all delegations not later than the day preceding the meeting. Subject to the consent of the Conference, the President may, however, permit the discussion and consideration of proposals or amendments even though these proposals or amendments have not been circulated in all working languages or have only been circulated the same day.

### Decisions on competence

### Rule 29

Subject to rule 27, any motion calling for a decision on the competence of the Conference to discuss any matter or to adopt a proposal or amendment submitted to it, shall be put to the vote before the matter is discussed or a vote is taken on the proposal or amendment in question.

### Withdrawal of motions

### Rule 30

A motion may be withdrawn by its sponsor at any time before voting on it has commenced, provided that the motion has not been amended. A motion which has thus been withdrawn may be reintroduced by any representative.

### Reconsideration of proposals

### Rule 31

When a proposal has been adopted or rejected, it may not be reconsidered unless the Conference, by a two-thirds majority of the representatives present and voting, so decides. Permission to speak on a motion to reconsider shall be accorded to only two speakers opposing the motion, after which it shall immediately be put to the vote.

## VI. VOTING

### Voting rights

### Rule 32

Each State represented at the Conference shall have one vote.

### Required majority

### Rule 33

1. Decisions of the Conference on all matters of substance shall, unless otherwi decided, be taken by a majority of two-thirds of the representatives present and votin

2. Decisions of the Conference on matters of procedure shall be taken by a simple majority of the representatives present and voting.

3. If the question arises whether a matter is one of procedure or of substance, the President of the Conference shall rule on the question. An appeal against this ruling shall immediately be put to the vote, and the President's ruling shall stand unless overruled by a majority of the representatives present and voting.

## Meaning of the expression "representatives present and voting"

### Rule 34

For the purpose of these rules, the phrase "representatives present and voting" means representatives present and casting an affirmative or negative vote. Representatives who abstain from voting shall be regarded as not voting.

## Method of voting

### Rule 35

The Conference shall normally vote by show of hands, but any representative may request a roll call. The roll call shall be taken in the English alphabetical order of the names of the States participating in the Conference, beginning with the delegation whose name is drawn by lot by the President.

## Conduct during voting

### Rule 36

After the President has announced the beginning of voting, no representative shall interrupt the voting except on a point of order in connexion with the actual conduct of the voting. The President may permit representatives to explain their votes, either before or after the voting. The President may limit the time to be allowed for such explanations.

## Division of proposals and amendments

### Rule 37

A representative may move that parts of a proposal or of an amendment shall be voted on separately. If objection is made to the request for division, the motion for division shall be voted upon. Permission to speak on the motion for division shall be given to only two speakers in favour and two speakers against. If the motion for division is carried, those parts of the proposal or of the amendment that are subsequently approved shall be put to the vote as a whole. If all operative parts of the proposal or of the amendment have been rejected, the proposal or the amendment shall be considered to have been rejected as a whole.

## Voting on amendments

### Rule 38

When an amendment is moved to a proposal, the amendment shall be voted on first. When two or more amendments are moved to a proposal, the Conference shall vote first on the amendment furthest removed in substance from the original proposal and then on the amendment next furthest removed therefrom, and so on until all the amendments have been put to the vote. Where, however, the adoption of one amendment necessarily implies the rejection of another amendment, the latter amendment shall not be put to the vote. If one or more amendments are adopted, the amended proposal shall then be voted upon. A motion is considered an amendment to a proposal if it adds to, deletes from or revises part of that proposal.

### Voting on proposals

### Rule 39

If two or more proposals relate to the same question, the Conference, unless it decides otherwise, shall vote on the proposals in the order in which they have been submitted.

### Elections

### Rule 40

All elections shall be held by secret ballot unless otherwise decided by the Conference.

### Rule 41

1. When one person is to be elected and no candidate obtains a majority of votes of the representatives present and voting in the first ballot, a second ballot restricted to the two candidates obtaining the largest number of votes shall be taken. If, in the second ballot, the votes are equally divided, the decision between the candidates shall be made by the drawing of lots.

2. In the case of a tie in the first ballot among three or more candidates obtaining the largest number of votes, a second ballot shall be held. If in the second ballot a tie results among more than two candidates, their number shall be reduced to two by lot, and the ballotting, restricted to them, shall continue in accordance with the preceding paragraph.

### Rule 42

When two or more elective places are to be filled at one time under the same conditions, those candidates obtaining a majority of votes of the representatives present and voting in the first ballot shall be elected. If the number of candidates obtaining such majority is less than the number of persons to be elected, there shall be additional ballots to fill the remaining places. The voting, however, shall be restricted to the candidates obtaining the greatest number of votes in the previous ballot, to a number not more than twice the places remaining to be filled, provided that after the third inconclusive ballot votes may be cast for any eligible person or delegation. If three such unrestricted ballots are inconclusive, the next three ballots shall be restricted to the candidates who obtained the greatest number of votes in the third of the unrestricted ballots, to a number not more than twice the places remaining to be filled. The three ballots thereafter shall be unrestricted, and so on, until all the places have been filled.

### Equally divided votes

### Rule 43

If a vote is equally divided on matters other than elections, the proposal or amendment shall be regarded as rejected.

## VII. COMMITTEES

### Creation of committees

### Rule 44

In addition to the Credentials Committee, the Conference shall establish three main committees for the performance of its functions. Each committee may set up working groups.

### Representation on the main committees

### Rule 45

Each State participating in the Conference may be represented by one representative on each main committee. It may assign to these committees such alternate representatives and advisers as may be required.

### Drafting Committee

### Rule 46

The Conference may appoint a Drafting Committee. This Committee shall give advice on drafting as requested by other committees and by the Conference.

### Quorum

### Rule 47

One third of the representatives on a committee shall constitute a quorum. The presence of a majority of the members of the committee is, however, required for a question to be put to the vote.

### Officers, conduct of business and voting in committees

### Rule 48

The rules contained in chapters II, V and VI above shall be applicable, mutatis mutandis, to the proceedings of committees, except that decisions of committees shall be taken by a simple majority of the representatives present and voting. In the case of reconsideration of proposals or amendments, however, the majority required shall be that established by rule 31.

## VIII. LANGUAGES AND RECORDS

### Official and working languages

### Rule 49

Chinese, English, French, Russian and Spanish shall be the official languages of the Conference. English, French, Russian and Spanish shall be the working languages.

### Interpretation from an official language

### Rule 50

Speeches made in any of the official languages shall be interpreted into the other official languages.

### Interpretation from other languages

### Rule 51

Any representative may make a speech in a language other than the official languages. In this case he shall himself provide for interpretation into one of these languages. Interpretation into the other official languages by the interpreters of the Secretariat may be based on the interpretation given in the first official language.

### Language of official documents

### Rule 52

Official documents of the Conference shall be made available in the official languages.

### Sound records of meetings

### Rule 53

Sound records of meetings of the Conference and its main committees shall be kept by the Secretariat in accordance with the practice of the United Nations.

## IX. PUBLIC AND PRIVATE MEETINGS

### Plenary meetings and meetings of the main committees

### Rule 54

The plenary meetings of the Conference and the meetings of the main committees shall be held in public unless the body concerned decides otherwise.

### Meetings of working groups

### Rule 55

Meetings of working groups shall be held in private.

## Communiqués to the press

### Rule 56

At the close of any private meeting, the Conference or the main committee concerned may decide to issue a communiqué to the press through the Secretary-General of the Conference.

## X. REPRESENTATIVES OF UNITED NATIONS SPECIALIZED AGENCIES AND THE INTERNATIONAL ATOMIC ENERGY AGENCY

### Rule 57

Representatives of the United Nations specialized agencies and the International Atomic Energy Agency may participate, without the right to vote in the deliberations of the Conference and its main committees upon the invitation of the President or Chairman, as the case may be, on questions within the scope of their activities.

## XI. OBSERVERS

## Observers for intergovernmental organizations outside the United Nations system

### Rule 58

Observers for intergovernmental organizations outside the United Nations system invited to the Conference may participate, without the right to vote, in the deliberations of the Conference and its main committees upon the invitation of the President or Chairman, as the case may be, on questions within the scope of their activities.

## Observers for non-governmental organizations

### Rule 59

International non-governmental organizations invited to the Conference may designate representatives to sit as observers at public meetings of the Conference and its main committees. Upon the invitation of the President or Chairman, as the case may be, and subject to the approval of the body concerned, these representatives may make oral statements on questions within the scope of their activities.

A/CONF. 48/4

United Nations
Conference on the human environment

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# Draft declaration on the human environment

only one earth

UNITED NATIONS

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CONFERENCE ON THE HUMAN ENVIRONMENT
Stockholm, 5-16 June 1972

Provisional agenda item 9

# DECLARATION ON THE HUMAN ENVIRONMENT

## Draft declaration on the human environment

## Note by the Secretary-General

Work on the preparation of a draft declaration on the human environment has been undertaken by an Intergovernmental Working Group established in accordance with a recommendation of the Preparatory Committee at its second session.[1] The Intergovernmental Working Group on the Declaration held two substantive sessions; the report on the first substantive session (10-21 May 1971) is contained in document A/CONF.48/PC/12 and that on the second substantive session (5-14 January 1972) in document A/CONF.48/PC/16. These reports contain drafts of the preamble and principles of a declaration on the human environment and were considered in turn by the Preparatory Committee at its third and fourth sessions.[2]

At its fourth session[3], the Preparatory Committee agreed that the draft preamble and principles of the declaration on the human environment as contained in Annex III to the report of the Intergovernmental Working Group on the Declaration at its second session, should be forwarded to the Conference for its consideration and appropriate action. It was understood that the agreement to forward the text to the Conference did not imply any expression of approval or disapproval thereof on the part of the Preparatory Committee.

The draft in question is annexed to the present note.

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[1] A/CONF.48/PC/9, paragraph 28

[2] A/CONF.48/PC/13, Chapter VII and A/CONF.48/PC/17, Chapter IV

[3] A/CONF.48/PC/17, paragraph 83

## Annex

## Draft text of a preamble and principles of the Declaration on the Human Environment

### Preamble

The United Nations Conference on the Human Environment,

Having met at Stockholm from 5 to 16 June 1972, and

Having considered the need for a common outlook and common principles to inspire and guide the peoples of the world in the preservation and enhancement of the human environment,

PROCLAIMS

1. Man is both creature and moulder of his environment. His physical needs and capacities are conditioned by age-long evolution in his terrestrial home. But his intellect and his social and moral nature have set him free from time immemorial to transcend and transform wild nature and to build his own society and culture, and thereby create for his progeny a better and more fully human life. Both aspects of man's environment, the natural and the man-made, are essential to his well-being and to the enjoyment of basic human rights - even the right to life itself.

2. Man has constantly to sum up experience and go on discovering, inventing, creating and advancing. In our time he has acquired, through the accelerating advancement of science and technology, the power to transform his surroundings in countless ways and on an unheard of scale. Used wisely, this power can bring to all peoples the benefits of development and the opportunity to enhance the quality of life. Wrongly or heedlessly applied, the same power can do incalculable harm to the human environment. We see around us growing evidence of man-made harm in many regions of the earth: dangerous levels of pollution in water, air, earth and living beings; major and undesirable disturbances to the ecological balance of the biosphere; destruction and depletion of irreplaceable resources; and gross deficiencies in the man-made environment of human settlements.

3. In our time also, the growth of population in certain areas, through both migration and unprecedented natural increase, has accelerated to rates which could frustrate all efforts to conquer poverty and under-development and to maintain a decent human environment, whereas other areas have not yet reached population densities conducive to economic efficiency and the high productivity that will permit the rapid increase of standards of living.

4. Meanwhile immense resources continue to be consumed in armaments and armed conflict, wasting and threatening still further the human environment.

5. Thus a point has been reached in history when we must shape our actions throughout the world with a more prudent care for their environmental consequences. Through ignorance or indifference we can do massive and irreversible harm to the earthly environment on which our life and well-being depend. Conversely, through fuller knowledge and wiser action, we can achieve for ourselves and our posterity a better life in an environment more in keeping with human needs and hopes. What is needed is an enthusiastic but calm state of mind and intense but orderly work. For the purpose of attaining freedom in the world of nature, man must use knowledge to build in collaboration with nature a better environment. To defend and enhance the human environment for present and future generations has become an imperative goal for mankind - a goal to be pursued together with, and in harmony with, the established and fundamental goals of peace and of world-wide economic and social development.

6. To achieve this environmental goal will demand the acceptance of responsibility by citizens and communities and by enterprises and institutions at every level, all sharing equitably in common efforts. Individuals in all walks of life as well as organizations in many fields, by their values and the sum of their actions, will shape the world environment of the future. Local and national governments will bear the greatest burden for large-scale environmental policy and action within their jurisdictions. A growing class of environmental problems, because they are regional or global in extent or because they affect the common international realm, will require extensive co-operation among nations and action by international organizations in the common interest.

## Principles

STATES THE COMMON CONVICTION THAT[*/]

1. Man has the fundamental right to adequate conditions of life, in an environment of a quality which permits a life of dignity and well-being and bears a solemn responsibility to protect and enhance the environment for future generations.

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[*/] Note: The order in which the paragraphs appear below was not discussed and is therefore provisional and subject to change.

2. The natural resources of the earth, including the air, water, land, flora and fauna, and especially natural ecosystems, must be safeguarded for the benefit of present and future generations through careful planning or management, as appropriate.

3. The capacity of the earth to produce vital renewable resources must be maintained and, wherever practicable, restored or improved.

4. The non-renewable resources of the earth must be employed in such a way as to guard against the danger of their future exhaustion.

5. The discharge of toxic substances, or of other substances in such quantities or concentrations as to exceed the capacity of the environment to render them harmless, must be checked to ensure that serious or irreversible damage is not inflicted upon ecosystems.

6. Economic and social development is essential for ensuring a favourable living and working environment for man and for creating conditions on earth that are necessary for the improvement of the quality of life.

7. Environmental deficiencies generated by the conditions of under-development pose grave problems and can best be remedied by and in the course of development.

8. The environmental policies of all States should enhance and not adversely affect the present or future development potential of developing countries or hamper the attainment of better living conditions for all and appropriate steps should be taken by States and international organizations with a view to reaching agreement on meeting the possible national and international economic consequences resulting from the application of environmental measures.

9. Resources should be made available to preserve and enhance the environment, taking into account the particular requirements of developing countries and any costs which may emanate from their incorporating environmental safeguards into their development planning and the need for making available to them, upon their request, additional international technical and financial assistance for this purpose.

10. Relevant environmental considerations should be integrated with economic and social planning to ensure that development plans are compatible with the need to protect and enhance the environment.

11. Rational planning constitutes an essential tool for reconciling any conflict between the needs of development and the need to protect and enhance the environment.

12. Planning must be applied to human settlements and urbanization with a view to avoiding adverse effects on the environment and obtaining maximum social, economic and environmental benefits.

13. Demographic policies, which are without prejudice to basic human rights and which are deemed appropriate by Governments concerned, should be applied in those regions where the rate of population growth or excessive population concentrations are likely to have adverse effects on the environment or development, or where low population density may prevent enhancement of the human environment and impede development.

14. Appropriate national institutions must be entrusted with the task of planning, managing or controlling the environmental resources of States with the view to enhancing environmental quality.

15. Science and technology must be applied to the identification, avoidance and control of environmental risks and the solution of environmental problems, in the furtherance of economic and social development.

16. Education in environmental matters, especially for the younger generations, is essential in order to broaden the basis for an enlightened opinion and responsible conduct by individuals, enterprises and communities in protecting and enhancing the environment.

17. Research and the free exchange and transfer of scientific and other knowledge and experience must be promoted to the fullest extent practicable in order to facilitate the solving of environmental problems taking particularly into account the needs of developing countries.

18. States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.

19. States shall co-operate to develop further the international law regarding liability and compensation in respect of damage which is caused by activities within their jurisdiction or control to the environment of areas beyond their jurisdiction.

20. Relevant information must be supplied by States on activities or developments within their jurisdiction or under their control whenever they believe, or have reason to believe, that such information is needed to avoid the risk of significant adverse effects on the environment in areas beyond their national jurisdiction.

21. Man and his environment must be spared the serious effects of further testing or use in hostilities of weapons, particularly those of mass destruction.

22. Co-operation through international agreements or otherwise is essential to prevent, eliminate or reduce and effectively control adverse environmental effects resulting from activities conducted in all spheres, in such a way that due account is taken of the interests of all States.

23. States shall ensure that international organizations play a co-ordinated, efficient and dynamic role for the protection and enhancement of the environment.

A/CONF. 48/6

United Nations
Conference on the human environment

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# Planning and management of human settlements for environmental quality

(subject area I)

only one earth

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CONFERENCE ON THE HUMAN ENVIRONMENT
Stockholm 5-16 June 1972

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# PLANNING AND MANAGEMENT OF HUMAN SETTLEMENTS FOR ENVIRONMENTAL QUALITY

(Subject Area I)

Report by the Secretary-General

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Recommendations for action

## INTRODUCTION

1. By the year 2000, world population will have risen to close to 7,000 million, three-quarters of them in the less-industrialized countries. Owing to internal migration, urban growth is likely to be at least twice as rapid as total population growth. To house this population will require building in one generation more structures than have been built in the whole of human history. Thus the provision of shelter for the vast majority of the human race now has a priority only less urgent than the prevention of famine or the elimination of war.

2. But shelter is not enough. The vast increase and migration of peoples represent one of the largest single causes of misery, insecurity and communal upheaval ever experienced by the human species. It falls with particular weight on the less-industrialized countries. It must be contained and canalized into functioning communities within which people can have access to work, raise their families and live with a modicum of human dignity and privacy.

3. This suggests the need for a new comprehensive approach to the development of human settlements - an approach which embraces environmental concerns - to further the attainment of minimum acceptable environmental conditions. Comprehensive environmental development can be defined as a method of development which takes into account the dynamic interactions both between the various sectoral components of human settlements such as population, housing, health, education (horizontal interactions) and between planning and implementation (vertical interactions).[1]

4. The need for comprehensive environmental development became evident in the course of the preparations for the Conference and was stressed by the Preparatory Committee. This concept is, therefore, the main theme of this paper.

5. The sections which follow attempt to explain in more detail why action is urgently needed in the area of human settlements, to identify the ultimate objectives of such action, to underline the need for a comprehensive approach to the problem, to examine the key issues which must receive priority, and to describe the means of achieving the desired objectives. The paper concludes with recommendations for national and international action.

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[1] For a further explanation of this concept, see paragraphs 109-115.

## Chapter I

## THE NEED FOR ACTION

6. The problem of human settlements has reached crisis proportions the world over. Governments in both industrialized and less industrialized countries are encountering increasing difficulties in providing their citizens with minimum environmental conditions. The problems are particularly pressing in the less industrialized countries where they are compounded by a lack of the resources necessary to take appropriate action.

### A. The crisis of human settlements

7. The environment of human settlements refers to those natural and man-made elements that constitute man's territorial habitat: where he lives, works, raises his family, and seeks his biological, social, spiritual and intellectual well-being.

8. Because man concentrates the majority of his activities in settlements, this is where the most dramatic changes in the natural environment take place. In turn, it is in human settlements where the environment (both natural and man-made) has its most concentrated and profound impact on man.

9. The crisis of human settlements stems from man's failure to understand the effects of urbanization, from indifference to the consequences of his intervention in the natural environment, or from his inability to take the necessary preventive or corrective actions. These have produced unsatisfactory settlements and settlement networks which make an inefficient use of resources, overconcentrate structures and activities, fail to integrate land use and infrastructure services, increase development costs, and bring about an unequal distribution of economic and social costs and benefits.

10. The consequences of the crisis are manifested in slums and shanty towns, pollution, congestion, noise, unemployment, poverty, inability to dispose of wastes, shortages of water and energy, and biological and general health hazards.

11. The reduction and ultimate elimination of these problems is an essential condition for the future health and well-being of humanity. To this end, it is necessary to establish a balance between the economic and social aims of development. Beyond this, and within the total scope of development, a balance must be reached among the sectoral components of the environment of human settlements.

## B. The need to establish minimum environmental conditions

12. Efforts to cope with the crisis of human settlements must be directed at achieving minimum acceptable environmental conditions in the following areas:

(a) shelter;

(b) employment;

(c) fulfilment of biological needs (e.g., freedom from epidemic diseases and from natural disasters, adequate supplies of water, food, energy, pure air).

13. Too many people today lack these essentials. Human happiness and creativity, however, imply leisure, which begins when some efforts can be diverted from the satisfaction of basic needs. Accordingly, action must also be directed to the fulfilment of:

(d) social needs (e.g., education, recreation, social intercourse and privacy);

(e) cultural needs (e.g., cultural activities, aesthetic values).

## C. Special problems of the less industrialized countries[2]

14. Today's staggering problems of urban settlements are common to industrialized and less industrialized countries alike. Highly industrialized pockets and over-populated cities exist in most of the less industrialized countries, and the degradation of the environment often proceeds in those places with unparalleled intensity. As to the problems of rural settlements, they are particularly acute in the less industrialized world.

15. Human settlements are thus important factors of development, and their planning and management for environmental quality should figure prominently in national development plans. Comprehensive environmental development appears no less essential to the less industrialized than to the industrialized countries. Indeed, the less a country is industrialized, the more it should look for short-cuts to development and the less it can afford costly mistakes arising from planning that fails to be comprehensive and to take due account of environmental considerations.

16. The prevention of environmental disruption may appear prohibitively expensive to countries where accelerated economic growth enjoys an absolute priority. But if the relative cost of measures preventing environmental disruption is much higher for a poor than for a rich country, it may also be true that the social price of environmental degradation is also correspondingly higher in a poor country, whose population is more vulnerable to its devastating effects on physical and mental health and is less prepared to adopt corrective measures.

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[2] See also Development and environment (A/CONF.48/10)

17. Nonetheless, the difficulties which the less industrialized countries are likely to encounter in the comprehensive environmental development of their human settlements should not be under-estimated. In addition to the obvious stringency of financial resources, these difficulties often include the absence of an organizational framework for setting up appropriate machinery for planning and policy-making and implementation. Furthermore, to be successful, the planning and management of human settlements frequently implies instituting social changes, such as land-reform and a more equitable income redistribution, which are eifficult to bring about.

18. To overcome or ease these difficulties and to pursue a process of development which cannot - and should not - be faithfully patterned after that of the industrialized countries will require new approaches, innovations in thinking, boldness and imagination.

## Chapter II

## THE KEY ASPECTS OF THE SETTLEMENTS PROBLEM

19. The aim of this section is to present the key aspects of the problem of human settlements.

20. The selection of certain aspects for more detailed examination was made in full awareness of the complexity of the environmental structure of settlements and of the interdependence of the components which form the human habitat.

21. The aspects selected, however, are the most important to human well-being and play the major role in shaping the man-made environment.

22. Although natural disasters cannot be considered to be an aspect of the settlements problem, they have their main impact on human settlements. Accordingly, this section concludes with a brief examination of natural disasters.

### A. Population growth and distribution[3]

23. Population growth and distribution are, because of their complexity and of their determining role in the formation and development of human settlements, the most important aspect of the human settlements problem. They are, therefore, discussed below in greater detail than the other aspects.

24. The population explosion which has been under way for some time is expected to carry world population to close to 7.000 million people by the end of this century. In other words, world population is likely to double within the next thirty years. If current trends of world population growth were to continue into the next century, the already intractable problems associated with population pressure would become totally unmanageable.

25. Viewed in isolation, world population growth figures indicate an approaching crisis. But if they are examined in conjunction with population distribution figures, it becomes clear that the crisis is already upon us.

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[3] The source of figures in this section is "Housing, building and planning: problems and priorities in human settlements" report of the Secretary-General to the twenty-fifth session of the General Assembly (A/8037).

26. By the year 2000, about one-half of the total world population will be living in urban areas, compared to about one-third in 1960. In the industrialized countries, the percentage of urban population is expected to rise between 1970 and 2000 from about 65 per cent to 80 per cent, and in the less industrialized countries, from about 25 to 45 per cent.

27. The meaning of the statistics is clear. There is an accelerating trend for man to congregate in large urban areas. The continuation of this trend, added to the existing low level of performance of urban systems, could soon lead to a major collapse in many of the largest cities of the world which are already functioning under conditions of great hardship and will further endanger the precarious existence of rural settlements in many parts of the world.

28. While the population crisis is of global dimension, the need to control population growth and to change migration flows is not felt equally in all countries. In some less industrialized countries, for instance, it may be counter productive to control the growth of sparse populations or to slow down or arrest migrations to small urban centres which, in these countries, constitute the growth poles of future development. On the other hand, both industrialized and developing countries may need to consider limiting population growth to achieve their development goals and to meet their environmental objectives in line with their avaialable resources. In view of the convening for 1974 of a World Population Conference, no attempt is being made in this paper to discuss extensively population control problems.

### (i) Urban Settlements

29. Population pressure on the natural and man-made environment is heavy in urban settlements generally and very heavy in a relatively few metropolitan areas. Population movements to the focal points of development have varied over the recent period and depend on local conditions. There is, however, a constant factor: the natural wish of man to improve his lot and seek better opportunities, whether for the current or future generations. This wish is often denied.

30. In the absence of comprehensive environmental development leading to effective policies of population distribution, and other appropriate measures, most countries have witnessed a sharp fall in the quality of the environment of urban settlements. This is particularly true in large cities favoured by migrants, where the conflict between the haphazard juxtaposition of man-made elements and the natural environment is at a peak. This conflict is producing an enormous amount of human misery and environmental degradation.

31. The major problem facing nearly all the great cities in the world is uncontrolled growth. For the most part, efforts to control growth so that it does not exceed the capacity of urban areas to absorb it have failed.

32. In considering the policies that will have to be used if the growth of cities is to be controlled, valuable lessons can be drawn from, among others, the examples of Canberra and of the new towns of the USSR.

33. In Canberra, the establishment of a single authority for overall planning, development and construction, including control of a leasehold system of land tenure, has prevented population expansion from being accompanied by land shortages or by declining environmental standards.

34. In the USSR, the creation of new towns, or growth-poles, based on the development of new industries, has been the major factor in channelling migration movements towards new development areas and in protecting the older cities from overgrowth.

35. These examples point to the need for a judicious mixture of controls and incentives to arrest the cancerous growth of cities. The free play of spontaneous developments, which in some cases in the industrialized world has resulted in a reversal of migration away from the centres of cities to their peripheries, cannot be relied upon to achieve this goal. Experience suggests that a much stronger set of controls is required than society in most parts of the world has been willing to accept so far.

36. With some exceptions, less industrialized and industrialized countries alike are faced with a growing and broadly similar urban crisis. In the less industrialized countries, however, this crisis takes on added dimensions: the growth of urban areas usually proceeds at faster rates and the resources which are available to cope with the crisis are fewer than those in the industrial world.

37. It would seem essential that governments formulate and adopt policies dealing with the growth and distribution of productive forces and of human population in relation to the role, location and size of human settlements. Particular attention will have to be paid to the need to restrict the rapid accumulation of large numbers of people into a few huge metropolitan areas.

## City centres

38. Central city areas, especially those of the major cities, are the parts of urban settlements where the concentration of the entire range of human activities is the greatest and the most complex.

39. The crisis of city-centres is reaching alarming proportions in many parts of the world.

40. Traditionally, a co-existence developed between housing, artisanal industries, business and many other economic and socio-cultural functions for which the centres acted as clearing-houses for the exchange of goods, ideas and knowledge. This co-existence is now threatened. Although most of the industries which in the past were centrally located and caused disruption and damage to the environment have gradually moved out, living and working in central areas has become an often traumatic experience. This is particularly true of the city centres in many industrialized countries, which exhibit similar problems of environmental degradation.

41. The numerous and highly competitive activities entailing land use overwhelmed the limited space and created a situation of overcrowding, functional incompatibility and cultural degradation. There ensued an over-concentration of traffic with its inevitable consequences of air pollution, visual obstruction by masses of vehicles and a disproportionate consumption of central spaces for transport needs.

42. Structures of historic origin are often unable to meet modern requirements and, notwithstanding their value, frequently face demolition. Some of the future-oriented activities hitherto dominating central areas tend to abandon the stifled centre and look for more favourable locations.

43. In some industrialized countries, inflationary costs, inadequate taxation systems, and the absence of appropriate controls on land use, have added the paradox that large areas in the central city are actually physically abandoned. There, decaying buildings with no settled occupants, become haunts of violence and fear.

44. The absence of controls governing land use is particularly nefarious in city centres of many market-economy countries. In most cases, the incremental value of land flowing from community growth, has not been made available to the community to finance its further development, but has largely accrued to land speculators.

45. Only enlightened and careful planning aimed at an appropriate balance of physical, economic and social goals can counteract the continuing deterioration and degradation of city centres. This planning approach is inasmuch necessary as city centres, are the "brains " of the economy and the "hearts" of the social and cultural life of the nation. This is illustrated by the example of Warsaw.

46. The reconstruction of Warsaw after World War II reflects a comprehensive approach to the environmental and functional shaping of the city in keeping with socio-economic objectives. It allowed the harmonious development of various functions within a revitalized central city area.

Transitional urban settlements[4]

47. A growing number of settlements are "transitional" in the sense that their inhabitants are undergoing a social and economic change, often from a rural to an urban way of life, in the hope of becoming integrated into urban society. Frequently, however, the change is not completed, stagnation sets in, and so-called transitional urban settlements tend to become permanent.

48. Although in most cases transitional settlements are located at the urban periphery, in some cities of the industrialized countries, these settlements are at the city centres.

49. In the less industrialized countries, transitional settlements are inhabited by a large proportion of the urban population and form the fastest growing part of their urban areas. The degree of environmental deprivation found there is devastating. People live in these settlements at the lowest subsistence level, lacking basic services such as access to potable water, sewage and garbage disposal. Living accommodations are overcrowded, offer inadequate protection from the elements, and are surrounded by a densely packed micro-environment which provides a fertile breeding ground for vermin and pestilence and within which fire is a constant hazard. Access to normal community facilities such as health, education and recreation is very difficult if not impossible. Sickness and infant mortality rates are high and life expectancy short.

50. Although they are inseparably linked to the cities, often providing them with reserve land and with many elements of their life support, little or no planning care has been devoted to transitional areas. As a rule, these areas are on the periphery of jurisdictional powers where they often suffer from a reckless exploitation of local resources, a singular promiscuity of land uses, and dereliction.

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[4] Also commonly referred to as "marginal areas".

51. Transitional settlements may be inevitable but they need not be unorganized or characterized by conditions of environmental squalor, as they are at present. A new approach is required to cope with existing transitional settlements and to provide for new population growth. To this end, it seems necessary to give increasing emphasis to the environmental improvement of existing settlements rather than to concentrate only on clearance and re-housing, and to the provision of land and essential services where settlers can build their own houses rather than to formal public housing projects, this has been done, to a degree, in some countries including Peru, Turkey and Algeria.5/

(ii) Rural Settlements

52. The less industrialized countries, whose population will still be predominantly rural by the end of the century, need to pay special attention to the environmental aspects of rural development. In these countries, rural areas face incomparably greater problems than they do in the industrialized world.

53. The disparity in living conditions between urban and rural settlements renders backward rural areas particularly unattractive to the younger generation whose social aspirations are higher than those of their parents. The ensuing migration to cities accelerates the process of aging and decay in rural settlements, which are deprived of their most dynamic human resources. A vicious circle thus sets in.

54. Some movement towards narrowing the gap of living standards and opportunities between rural and urban settlements is, therefore, essential. Since the future of rural settlements is intrinsically linked to economic development and urbanization, which will continue to shift employment opportunities from agriculture to industry and the service sector, progress in this area would seem to hinge on a degree of decentralization of activities which are now unduly concentrated in the large urban areas.

55. This implies establishing regional and sub-regional growth poles in existing (or new) towns through the location of new productive enterprises; the provision of better educational facilities including, where appropriate, universities and technical colleges; the improvements of the necessary infrastructure of water

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5/ See also sub-section on Housing, paragraphs 72-73.

supply, waste disposal, energy, transport, etc.; the supply of essential services including health services and social and cultural amenities; and the establishment of local mass media facilities such as radio and television stations to counteract the urban orientation of existing mass media which tend to glamourize the cities and to ignore rural areas.

56. The implantation of new productive enterprises in towns destined to become growth-poles could be assisted by the spread of intermediate technology which does not require heavy outlays on capital goods. This would keep the cost of new work places within the limits of available financing and promote the use of renewable resources.

57. The successful establishment of such growth poles in towns and rural areas by the enhancement of their amenities and opportunities of work can lessen chaotic movements of migration, prevent too vast of immediate a transfer of people to the large urban areas and underpin smaller neighbouring rural settlements.

58. An experiment in this direction has been carried out in Venezuela by the establishment of small planned communities in rural areas through the construction of well over 120,000 dwelling units and the adequate provision of water supply, electrification, education and employment opportunities.

59. The opening up of virgin lands offer a special opportunity for implementing from the start a pattern of human settlements development which gives proper weight to the environmental dimension.

## B. Industry

60. Because of its phenomenal recent growth and of the revolutionary technological changes which have accompanied it, industry is the cause of many contemporary environmental problems.

61. Where there has been no effective environmental planning, industries have been located in a haphazard way, often intermixed with residential and other areas of conflicting use.

62. More recently, accelerating industrialization has caused population to be increasingly located around industrial complexes. These have usually been concentrated in a few large centres resulting, as noted earlier, in excessive concentrations of population. Large economically active population centres provide both markets and labour, encouraging further industrial growth. Urbanization thus "snowballs" if uncontrolled.

63. Excessive concentrations of industry lead to a disparity in economic development between regions. In addition, over-concentration of industry causes serious environmental over-loading, particularly in terms of pollution and congestion, and a consequent threat to health and a reduction in the quality of life.

64. In some cases, these problems are being alleviated. For example, certain industries have become so large that they have moved outside urban areas. Furthermore, in a few urban centres good environmental planning is gradually bringing about an improved pattern of urban industrial location. Whilst these developments are encouraging, in most countries the crux of the problem remains at the national and regional levels, where the development of reasonable industrial patterns within overall environmental development plans has still to be achieved.[6/]

65. To be effective, such plans will have to be based on, among other factors, optimal population distribution, regional resources and environmental considerations.

66. Plans must lead to action. Such action will have to include controls on industrial location which take account of the type of industry and its processes, of the number of workers to be employed and, in the case of "noxious" industries, of the disposal of wastes and other external effects. Criteria will be needed to establish adequate working conditions, access, siting and physical appearance and to limit adverse industrial effects on the population and the surrounding environment. More generally, in examining alternative locations greater account will have to be taken than hitherto of the interests and objectives of the community as a whole rather than of mere commercial profitability. In this connexion, the examples of new towns with appropriate lay-outs of industrial zones such as Cumbernauld (United Kingdom), Nowa Huta (Poland), Le Vaudreuil (France) and Duna Varoš (Hungary) are instructive.

67. In many less-industrialized countries it would clearly be difficult or inappropriate to establish rigorous controls and criteria governing the location of industry and protecting the human environment from the undesirable side-effects of industrialization. This is not to say, however, that no controls or criteria

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6/ There are some exceptions. In a few countries (e.g., USSR, Poland) strict environmental standards governing the location of industries have been established.

whatsoever are required in these countries, and that the development of rational industrial patterns in the context of environmental development plans need not be a fundamental consideration.

## C. Housing

68. The residential environment probably has the most profound impact on human health, behaviour and satisfaction, since this is where people spend the greatest part of their lives, form their families, rear children and develop social habits and intercourse.

69. Although decent shelter is thus a major human need, the current housing picture contains enormous dark spots all over the world: more than a billion people live in appalling housing conditions and there is a formidable global shortage of desperately needed dwellings. This situation is likely to worsen over the period ahead.

70. Mere statistics fail to capture the true dimension of the urban-residential crisis. At the community level, the crisis is aggravated in many countries by a growing polarization of the population according to the location and quality of their houses. Although overall living standards have risen in most countries over the past decade, the supply of housing to low-income families remains far too small. The urban poor also bear the greatest burden of the mismanagement of the urban environment, as it is in the poorer areas that essential services are of the lowest standard.

71. The residential crisis looms largest in the metropolitan areas of the less industrialized countries, resulting in scattered housing developments, mixed land-uses, high rents, overcrowding and clandestine land occupancy.

72. It is difficult to see how the present critical situation can be alleviated unless more emphasis is placed on housing as an important component of social, economic and environmental development, and a better allocation of resources is made in favour of this sector. To this end, a number of alternative actions can be taken depending on each country's particular circumstances.

73. National housing agencies can be established, wherever appropriate and feasible, to launch building programmes and reduce the gap between the cost of dwellings and family incomes. This gap can be further reduced through the development of local skills and techniques and by promoting the use of local building materials. Greater efforts can be made to mobilize internal financial resources and to encourage people to help finance their housing requirements through the use of their savings. Because

investment in shelter is a major means of savings for the majority of low-income families, housing-related savings institutions must be established or strengthened to this end. While the possibility of cost reductions brought about by new technological processes must be fully explored, it is essential to avoid change for its own sake.

74. In countries where economic stringency prevents building on a massive scale, the desire and ability of citizens to construct their own home calls for public policy to concentrate on site layout and the provision of community facilties, leaving much of the construction to the people themselves. Their effort can be supplemented in various ways - for instance, by providing security of title or by inexpensive mortgages for those whose ambitions and incomes are rising. Interesting experiments in this direction have been carried out by a few countries including Peru, Ghana and Turkey.

75. Finally, it should be noted that the Economic and Social Council Committee on Housing, Building and Planning is studying the possibility of launching an International Housing Programme. This Programme appears to deserve careful consideration by governments.

## D. Transport

76. Transport and communications have emerged as the vital factors in land development in and between all but the most primitive of settlements. Dependence on transport increases with the growing size and rising economic activity of the settlement. Whilst increasing urban size offers at first some economies of scale in the construction and operation of transport systems, there comes a point at which increased concentration of traffic leads to diminishing returns reflected in congestion and a waste of resources. Systems to accommodate great concentrations of traffic in urban centres may do so at a reduced cost-efficiency ratio as a result of the need to construct additional facilities above or below ground to achieve traffic segregation.

77. The lack of comprehensive settlement planning in the past and the failure to foresee the growth of private vehicle traffic has led to the present inefficient state of urban transport systems. The problem has been compounded by the rapid growth of most cities and by the competing social claims on limited resources (both financial and technical) for investment in urban infrastructure and services.

78. The inflexibility of public mass transport systems to meet changing conditions has led to deteriorating services and, in some cases, to their complete withdrawal, causing serious problems for the lower income groups.

79. The obvious policy objectives is to create transport systems within and between human settlements which can efficiently carry people and goods. Such systems, however, must also be so designed as to produce the least possible disturbance. Environmental quality should not be sacrificed to apparent transport convenience.

80. If this objective is to be reached, it is essential that transport systems be conceived as an element of comprehensive environmental development. As the development and use of land is the basic generator of the demand for transport, and its spatial arrangement conditions the character and shape of the transport networks, the interaction between land-use and transport must be considered at the earliest stage of planning. It is also important that plans have a high degree of flexibility to meet changing economic circumstances and attitudes to transport.

81. Immediate action is required to meet head-on the crisis which automobiles have precipitated in so many cities of the world. The relinquishing of control of the streets and squares to automobiles has seriously contributed to the loss of human scale in most parts of the city. People hear the automobile in their dwellings and feel its impact in the streets. This is harmful for man (particularly the child), for nature, and for the development of reasonable transport networks. Furthermore, fighting air pollution while doing little or nothing about the pollution of human space by automobiles appears to be illogical.

82. It is essential to create streets and squares where the pedestrian is in control. This can be achieved through a judicious combination of regulations and incentives designed to limit the use of the automobile or, at least, to restrict the areas where it can be used.

83. It is also essential to devise satisfactory solutions to other problems generated by transport in the vicinity of human settlements, such as aircraft noise, pollution and noise caused by railroad traffic, and some of the environmentally disturbing side-effects caused by shipping activities in ports.

84. Efforts to bring transport problems under control would be greatly facilitated by greater public awareness of the need to minimize the effects of transport on the environment.

## E. Water supply, sewage and waste disposal

85. Water supply is an indispensable requirement for life and health and for nearly all the activities of human society. It therefore constitutes a vital element determining the quality of the environment of human settlements and the overall social and economic development possibilities of any given country. The disposal of waste is of critical importance for health and for the living standards of the population of towns and other settlements. The water supply and waste disposal situations in nearly all the countries of the world is highly unsatisfactory.

86. In the industrialized countries, the growing demand for water for communal and industrial purposes and, closely linked with it, the rising quantity of wastes, reduces the amount of dispcsable clean surface and underground water. The growth of industrial production of consumer goods results in the accumulation of solid wastes, which pollute the surrounding ground and water. There is also the serious problem of the discharge of untreated or insufficiently treated industrial and municipal liquid wastes into waterways. Present sanitary techniques in many countries are insufficiently applied or developed to prevent all harmful effects. Furthermore, knowledge of the health implications and ecological impact of many contaminants found in water is still very incomplete.

87. In the less industrialized countries, the main problem concerns the supply of pure water for the populations of settlements. Around 75 per cent of the urban population[7/] is still not supplied with water in houses or courtyards. The remaining 25 per cent is often supplied with unsafe or even polluted water and/or with an insufficient quantity of water. The proportion of rural population supplied with "acceptable" water amounts to only 10 per cent.

88. The less industrialized countries also face the serious and growing problem of fluid and solid waste disposal. Only 12 per cent of urban families in less industrialized countries have sewage facilities at their disposal. The poor water conditions and the accumulation of wastes degrade living standards and are also a source of disease.

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[7/] Water Supply, Sewage and Waste Disposal, contribution by WHO to the Conference.

89. Policies on water supply and waste disposal are important elements of comprehensive plans for the improvement of environmental conditions in human settlements. The existence of adequate water resources should be a leading criterion in planning the development of settlements. Determined efforts will have to be made to develop effective new waste disposal methods that cost no more - or are only marginally more expensive - than existing methods.

## F. Construction industry

90. The construction industry plays a two-fold role in defining the quality of the man-made environment. First, it is the major tool for shaping the physical framework of any settlement. Second, by creating a physical shape it has a basic impact on the functional and aesthetic quality of almost all man-made components of the human environment.

91. Contemporary building methods, characterized by mass production and mechanization, interfere with the environment by emitting noise, gases and vibration. Thus the interaction between building and the environment has become a complex and increasingly critical phenomenon typical of the modern industrial era.

92. Development is posing an enormous challenge to the construction industry. The task of meeting this challenge is aggravated by a number of factors. Few countries have long-term programmes for housing production. The construction industry in a number of countries is especially vulnerable to cyclical peaks and declines in activity; this makes it difficult to maintain stable employment and to promote efficiency and better technology. The availability of land with accompanying services is also a major bottleneck.

93. It is essential that construction be given an appropriate place in comprehensive environmental development, particularly in the less-industrialized countries. In these countries, whose construction efforts are hampered by shortages of resources, much greater emphasis must be placed than has been the case so far on the development of local building materials and the use of labour intensive methods using existing human resources. This has been done with success in a number of countries, including Togo.

## G. Health and well-being[8]

94. In the development of settlements, the health, social and cultural aspects of the environment have very often been set aside, neglected or sacrificed in the industrialized and the less-industrialized countries alike. Mental, as well as physical, health is thus endangered.

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[8] See Educational, informational, social and cultural aspects of environmental issues (A/CONF/48/9)

95. Conflicts arise when the established cultural patterns and the new settlement structures are incompatible, leaving no leeway for adjustments. Examples of such situations can be found in immigrant communities and resettled villages. These conflicts are increasingly apparent in affluent societies, as well, where scale, distance, density and other factors impose severe limits upon individual choices for employment, association, and diversity of experience.

96. The physiological effects of overcrowding, inadequate sanitation, and poor housing, are well known and, in some cases, well documented. The greater incidence of respiratory diseases in overcrowded areas and the higher incidence of gastro-intestinal diseases in areas with poor sanitation, are examples in this respect.

97. The psychological needs of man for contact and privacy, for freedom from noise, for group association in social and cultural activities and for relaxation in pleasant surroundings, remain unfulfilled in the poorer neighbourhoods. The stress and strain of life in such situations shows up in an increased incidence of mental disorders and diseases.

98. The pathogenic mechanisms of such diseases and the establishment of causal relationships between social conditions and mental and psychosomatic problems need further study. Such study can assist action to combat the problems of isolation, segregation, loss of identity and consequent anti-social behaviour. Measures must be designed to facilitate the social integration or re-integration of low-income groups.

99. Measures are also required to improve the working environment which tends to be unhealthy and dehumanizing in nearly all countries. Efforts should not be limited to providing employment opportunities - although this, of course, must be the first priority wherever there is significant unemployment or under-employment. Action is also necessary, however, to ensure that work is performed in an environment that meets reasonable requirements of physical and mental health. This can be done through the adoption of preventive industrial safety measures, the improvement of occupational health services and through the deployment of greater efforts to adapt the machine to man and to humanize the organization of work. Sweden, among other countries, has made great progress in this direction.

100. The need for recreation also needs to be fulfilled. This requires the provision of adequate urban facilities, the protection of outdoor recreation areas from encroachment by infrastructure, industrial or commercial projects and the easing of access to these areas for the urban masses.

101. Finally, it is imperative to establish a range of educational and recreational facilities for children and youth who are, or risk becoming, the main victims of derelict quarters, slums, shanty towns and squatter areas.

## H. Natural disasters [9]

102. With the exception of war itslef, nothing poses so severe a threat to the human environment as do natural disasters such as hurricanes, earthquakes, floods, tidal waves, volcanic eruptions and tornados. Latest figures indicate that one million people died either directly or indirectly from natural disasters during the past decade. Of these, over 500,000 were killed as a result of the Bay of Bengal tidal waves in 1970, and 77,000 perished in the Iranian (1969) and Peruvian (1970) earthquakes.

103. In addition to the toll of human life which they take, natural disasters also cause heavy economic losses. Tropical cyclones in Southeast Asia alone caused damage amounting to about $500 million in 1970, while the Chilean earthquake of July 1971 resulted in damage of the order of $150 million.

104. Loss of human life and property through natural disasters is accompanied by severe social and physical disruption which tends to bear hardest on those sections of the population least able to withstand it.

105. Losses from natural disasters grow with time and in keeping with population growth (which increases the numbers of people at risk), urbanization (which adds to the loss potential in terms of life and property) and economic development (which raises the volume and value of property that can be destroyed).

106. The high and increasing losses caused by natural disasters are not evenly distributed between the industrialized and the less industrialized countries. The "disaster-prone" areas are predominantly a ring of countries bordering on the South China Sea - typhoons; the Bay of Bengal - cyclones; the Western Atlantic, the Caribbean and the Gulf of Mexico - hurricanes; the northern edge of Africa - floods and earthquakes; the Near East (Iran to Yugoslavia) - earthquakes; and the West Coast

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[9] The source of figures in this section is "Outline for a feasibility study for the establishment of an international natural disaster warning system", report prepared by the Smithsonian Institution for the United Nations Office of Science and Technology (July 1971).

of the Americas - earthquakes. Of 719 disaster impacts recorded world-wide since 1947, 511 occurred in Asia, Africa and Latin America. Furthermore, average loss of life in Asia per disaster was 3,270 compared to 40 in North America.

107. The magnitude of the effects of natural disasters on human settlements, the rising human life and property risks and the imbalance of the impact between geographical areas, militate in favour of the urgent adoption of effective measures at the national, regional and global levels designed to mitigate the consequences of natural disasters.

## Chapter III

## THE MEANS FOR ACTION

108. Few countries undertake the conscious and organized formulation and implementation of settlements policies on the basis of accurate information and of a thorough assessment of alternatives. As a result, nearly all the problems outlined in the preceding section remain unresolved in the vast majority of countries.

109. Deficiencies generally lie in the unbalanced or incomplete use of the opportunities planning offers; in the lack of effective implementation of plans whether through neglect or through inadequacies of legislation and administrative organization; in insufficient research and training; and in the absence of effective public participation in the decision-making and implementation process.

### A. Planning and implementation

110. The proper planning of human settlements requires giving due weight to the inter-relationships of their sectoral components, so that action is not considered independently in one sector which might have adverse environmental effects on others.

111. Planning must also pay greater attention to qualitative -- as opposed to quantitative -- aspects of planning criteria that has been the case so far.

112. In other words, to be effective planning must be comprehensive in the sense of embracing all sectors and all aspects of human settlements within an interdisciplinary framework.

113. When it is thus conceived, planning has a number of important advantages over any other approach: it establishes broad objectives which provide the context for co-ordinating individual actions; it permits an evaluation of a wide range of consequences associates with any change; it provides an appropriate tool for understanding and guiding the diverse but interdependent elements of settlements so that economic and social progress can be achieved with maximum benefit to the settlement and minimum despoliation of the natural environment; it facilitates the optimal use of existing resources.

114. The adoption of a comprehensive planning approach will occasionally lead to shifts in existing priorities and the inclusion of environmental considerations may require some re-allocation of public and private expenditures. This need not necessarily imply increased costs, however, since greater efficiency in the use of resources should result from comprehensive planning.

115. Within the framework of comprehensive planning, some specific planning methods could at the local level be used, such as : advocacy planning in which planners become advocates of particular groups for the protection of their concerns, and responsive planning in which solution hypotheses are presented to all interested groups and where the final solution comes out of the consensus of all participants.

116. Planning should not be viewed as a panacea, however. Like absence of planning, over-planning can also lead to monumental disasters. The extent to which planning should be undertaken cannot be arbitrarily defined in advance. Planning must not follow rigid patterns but should be conceived as a flexible process, to take account of particular conditions and problems in different countries and to allow for creativity and innovation in keeping with advances in knowledge and with the development of new technologies.

117. But above all, perhaps, planning should be followed by - and feed on -- effective implementation. Many good plans came to naught in the past because of failures in implementation or of neglect of the need to frequently review and adjust plans in the light of the results obtained in the course of their execution. A dynamic interaction between planning and implementation is required, through a proper feed-back mechanism.

## B. Legislation and organizational arrangements[10/]

118. The making and implementation of plans can be effectively carried out only if provision is made for enabling mechanisms in the form of adequate legislation and organizational arrangements.

### (i) Legislation

119. Existing legislation in most countries is too narrow in scope, inadequate or out of date to cope with environmental problems. It generally lacks an integrated and multi-disciplinary approach. It needs to be broadened, simplified, strengthened and, above all, effectively enforced. To avoid the need for frequent review, legislation should set broad objectives and provide a general legal framework within which all appropriate action can be implemented.

### (ii) Organizational and institutional arrangements

120. An adequate administrative organization should include a central body or authority at the national level and authorities at the regional and local levels, working closely with the planning machinery.

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[10/] See International organizational implications of action proposals (A/CONF.48/11)

121. The central body should preferably co-ordinate and promote decisions and should not be confined to an advisory role; it should have wide contacts with universities, research institutes, etc., to ensure a continuing flow of information and research results required in decision making, and also provide for a feed-back system; it should maintain close lines of communication with regional and local authorities to ensure the proper co-ordination of implementation efforts; it should encourage participation by citizen groups and the population at large.

122. The regional and local authorities should be strong enough to cope comprehensively and systematically with environmental development problems arising in their regions or urban or rural areas; they should not be confined to an executing role but, whenever appropriate, should have the opportunity to express their views to the central body and participate in the decision-making and implementation process; they should dispose of sufficient financial and other resources to discharge their functions.

123. This implies a degree of decentralization which has not yet been reached in many countries. More particularly, not only the national but also the regional and local authorities must be given the means of imposing controls and providing incentives through economic and fiscal measures, in keeping with the responsibilities with which they are entrusted.

## C. Research and training

124. Greater emphasis needs to be placed on research of an inter-disciplinary nature aimed at yielding results which can be applied quickly and effectively. Accordingly, there is need for a framework for the co-ordination of research in all disciplines of the natural and social sciences having a bearing on environmental problems of human settlements. However, it must be recognized that even the best research has no effect unless there is effective communication between those who deal in research and theory, and those who deal in programmes and action.

125. Because the treatment of environmental disfunctions cuts across so many disciplines, the provision of appropriate training for environmental administrators and other "environmentalists" raises difficult problems. The best solution might be to institute environmental training in various disciplines, to create new disciplines to fill gaps in the traditional educational systems and to place emphasis on inter-disciplinary team-work and on the periodic retraining of professionals working in the field of environment. Particular attention should be

paid to the establishment of an institutional framework for the education and training of civil servants dealing with environmental problems.

## D. Public participation and information[11]

126. Imaginative steps should be taken to mobilize public opinion behind the development and implementation of effective environmental measures and to ensure the active participation of the public in the planning and management of human settlements for environmental quality.

127. When people themselves can participate in the process of transition and development, remarkable results can be achieved. People can adapt in a very short time. A Puerto Rico study showed that people could move through 600 years of history in 20 years; in New Guinea they skipped over 2000 years.

128. To permit this kind of adaptation, the environment of human settlements must be malleable. It is the intractable environment of human settlements that people can do nothing with that causes the problems -- even when it is well built.

129. On the other hand, the difficulty of enlisting the active participation of the public should not be under-rated. Participation is not easy. It is often difficult to get people to articulate what they want; they are not accustomed to being asked. But the basis of any action should always be a sound knowledge of the existing patterns of life of the people who are to be served.

130. Participation is only meaningful if those participating are well informed. In fact, they are usually deprived of full information. There is generally little attempt by professionals to display the choices open to society in a clear manner — to expose the trade-offs. Considerably greater efforts are needed in this direction.

131. Finally, special efforts should be made to interest young people in the environment of settlements, an issue which, by its very nature, should be at the centre of their preoccupation for a better future world.

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11/ See also Educational, informational, social and cultural aspects of environmental issues (A/CONF.48/9)

## Chapter IV

## RECOMMENDATIONS FOR ACTION

### A. Recommendations for national action

132. Direct action aimed at improving the environmental quality of human settlements must clearly be undertaken at the national level, with each country pursuing policies appropriate to its particular conditions (availability of financial and other resources, political, institutional, social and cultural framework).

133. The foregoing sections of this paper contained a number of proposals designed to ease the problems of human settlements. These proposals are commended to national governments for their consideration.

134. In addition, it is recommended that the attention of governments be drawn to the need for action in the following priority areas:

(a) the adoption of a comprehensive environmental development approach to policy-making and implementation in the field of human settlements;

(b) the improvement of existing - or the establishment of new - legislative and institutional frameworks to render such an approach effective;

(c) the launching or further development of national population policies dealing with the growth and distribution of population in relation to the rôle, location and size of human settlements and in keeping with a rational use of resources;

(d) the assessment of urban and rural water supply and sanitation[12] problems; the adoption and implementation of national policies to solve these problems; and the setting - and inclusion in national development plans - of specific annual targets designed to meet the objectives of the WHO water supply and sanitation programme for the United Nations Second Development Decade; and the creation of the necessary institutions and the training of skilled manpower for the planning and management of water supply and sanitation system;

(e) the allocation of greater financial and other resources to the housing sector so as to preserve what is valuable in the existing housing stock; launch, wherever possible, public housing projects; revitalize city centres; improve transitional settlements; promote mutual help and aided self-help; and provide, where appropriate "site and service" facilities to new migrants;

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[12] See also Environmental aspects of natural resources management (A/CONF.48/7)

(f) the establishment of regional and sub-regional growth poles in order to revive and preserve rural settlements and to reduce mass migration to large urban centres.

(g) the development of appropriate mass media channels to strengthen the capacity of growth poles to revive and preserve rural settlements through vocational and motivational communications;

(h) the adoption and implementation of a dynamic policy of land use through appropriate incentives and controls designed to prevent land speculation, ensure the proper location of industries, provide security of tenure in transitional areas and restrict motor vehicle traffic;

(i) improving human environment; specifically, the development of city and intercity transport systems for environmental quality and the solution, by technical, legislative and administrative measures, of existing problems of traffic congestion and safety and of air, water and noise pollution from transport sources;

(j) the provision of educational and recreational facilities for youth of the poorer urban and rural areas;

(k) the mobilization of public support for the comprehensive environmental development of human settlements and to achieve the highest possible degree of public participation in formulating and implementing policies.

## B. Recommendations for international action

135. The recommendations listed below are designed: (a) to support action at the national level through the establishment of services and facilities which could be made available to governments on request or (b) to help solve problems whose scope clearly transcends national borders.

(i) Recommendations to development assistance agencies

136. It is recommended that:

- all development assistance agencies, whether international, such as UNDP and IBRD, regional or national, give high priority to responding to requests of governments for assistance in the field of human settlements, notably in housing, transportation, water and sewage problems, the mobilization of material human and financial resources and the improvement of transitional urban settlements;
- these agencies also be prepared to assist the less-industrialized countries to take account of the environmental problems of development projects; to this end, they should recruit appropriate environmental staff.

(ii) International programme for "Environmental improvement areas"

137. It is recommended that:

- governments designate to the Secretary-General areas in which they have committed themselves (or are prepared to commit themselves) to a long-term programme of environmental improvement.
- countries concerned would presumably charge an appropriate body with planning and supervising the implementation of such a programme for areas which could vary in size from a city block to a national region.
- countries which are prepared to launch such a programme of environmental improvement should be prepared to:
- make long-term commitments of financial and other resources;
- welcome international co-operation through seeking the advice or assistance of competent international bodies;
- share internationally all relevant information on the problems they encounter and the solutions they devise in developing these areas.

(iii) Bilateral and regional consultations

138. Certain aspects of human settlements can carry international implications, e.g. "export" of pollution from urban and industrial areas, effects of seaports on international hinterlands. Accordingly,

it is recommended that:

- the attention of governments be drawn to the need to consult bilaterally or regionally whenever environmental conditions or development plans in one country could have repercussions in one or more neighbouring countries.

### (iv) Research

139. The review of issues and problems contained in this paper has disclosed a great many areas where additional knowledge is needed which can only be obtained through new research directed at its application. (It should be emphasized, however, that research should not be viewed as a precondition for national action but as a means of supporting and furthering such action).

140. Accordingly, it is recommended that Governments and the Secretary-General, the latter in consultation with the appropriate United Nations agencies, take the following steps:

- entrust the overall responsibility for co-ordinating environmental research to any central body that may be given the co-ordinating authority in the field of the environment;[13]
- identify, wherever possible, an existing agency within the United Nations system as the principal focal point for initiating and co-ordinating research in each principal area and, where there are competing claims, establish appropriate priorities;
- designate the following as priority areas for research:
  - theories, policies and methods of comprehensive environmental development
  - water supply, sewage and waste disposal, particularly in semi-tropical and tropical regions - (principal responsible agency: WHO)
  - problems of transitional settlements including socio-economic factors of rural-urban migrations - (principal responsible bodies: ESA (CHBP), WHO, ILO)
  - environmental socio-economic indicators to measure the condition of human settlements and to identify, over time, trends in their development[14]
  - alternative methods of meeting urban transportation needs - (principal responsible bodies: ESA (Resources and Transport Division) and CHBP ).
  - psycho-social stresses in urban conglomerates (principal responsible agency: WHO).

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13/ See also International organizational implications of action proposals (A/CONF.48/1

14/ This research area is covered in subject area IV, Educational, informational, social and cultural aspects of environmental issues (A/CONF.48/9)

141. It is further recommended that Governments consider co-operative arrangements to undertake the necessary research whenever the above problem areas have a specific regional impact. In such cases, provision should be made for the exchange of information and research findings with countries of other geographical regions sharing similar problems.

(v) Information exchange

142. The exchange of information involves a variety of techniques including the use of existing centres, seminars, exchange of personnel, etc.[15/]

143. Although most research is likely to be carried out nationally, much of it will have international implications. The exchange of information covering the results of research and experimentation constitutes one of the most important means of assisting countries in the planning and management of their human settlements. Experience has shown that information exchange can best be carried out through people not papers.

144. Accordingly, it is recommended that:

- governments take steps to arrange for the exchange of visits by those who are conducting research in the public or private institutions of their countries;
- governments and the Secretary-General ensure that the exchange of information concerning past and on-going research, experimentation and project implementation covering all aspects of human settlements, which is conducted by the United Nations system or by public or private entities including academic institutions, be accelerated.

(vi) Training

145. The shortage of trained personnel is one of the major constraints on the ability of the international community to implement the other recommendations contained in this paper. There is a world-wide scarcity of people capable of providing training in the skills needed to deal with interdisciplinary systems of interacting activities. Although such training is urgently required, few existing institutions are in a position to give it.

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[15/] The overall subject of information exchange is covered in greater detail in subject area IV (A/CONF.48/9)

146. It is recommended that:

- Governments and the Secretary-General give urgent training of "integrators".

147. Shortages of skilled personnel also exist in particular sectors of human settlements. Training in these areas could be provided by international, regional or national training institutions.

148. To this end, it is recommended that:

- governments and the Secretary-General ensure that the institutions concerned be strengthened and that special training activities be established for the benefit of the less-industrialized countries, covering the following:
  - . intermediate and auxiliary personnel for national public services who, in turn, would be in a position to train others for similar tasks - (principal responsible bodies: WHO, ESA (CHBP), UNIDO, FAO)
  - . specialists in environmental planning and in rural development - (principal responsible bodies: ESA (CHBP), FAO)
  - . community developers for self-help programmes for low-income groups - (principal responsible body: ESA (CHBP))
  - . specialists in working environments -(principal responsible bodies: ILO, ESA (CHBP), WHO)
  - . planners and organizers of mass transport systems and services with special reference to environmental development-(principal responsible body: ESA - Resources and Transport Division).

149. It is further recommended that:

Regional institutions take stock of the requirements of their regions for various environmental skills and of the facilities available to meet these requirements in order to facilitate the provision of appropriate training within regions.

(vii) Programme to reduce losses from natural disasters

150. In contrast to the other subjects covered in this paper, natural disasters pose the environmental problem of protecting man from nature. In view of the importance and complexity of the subject and of its national, regional and global significance, a paper embodying a programme to reduce losses from natural disasters is annexed.

(viii) Water supply

151. The shortages of adequate supplies of safe water, and of sanitary and sewer services from which most human settlements suffer, render action imperative in this area.

152. It is recommended that WHO increases its efforts to support governments in planning for improving water supply and sewerage services through its community water supply programme.

153. It is recommended that development assistance agencies give higher priority to supporting governments in the financing and implementation of water supply and sewerage services as part of the objectives of the United Nations Second Development Decade.

(ix) Population

154. It is recommended that the Secretary-General ensure that during the preparations for the 1974 World Population Conference, special attention be given to population concerns as they relate to the environment and, more particularly, to the environment of human settlements.

# ANNEX I

## NATURAL DISASTERS

### Recommendations for action

A. Control and mitigation
  (i) Prediction and Communication
  (ii) Prevention

B. Pre-Disaster Preparedness

1. Following a comprehensive report of the Secretary-General on assistance in cases of natural disaster[1] and as a result of Economic and Social Council resolution 1612 (LI) of 29 July 1971 and of General Assembly resolution 2816 (XXVI), the Secretary-General has been requested to appoint a Disaster Relief Coordinator heading a small permanent office in the United Nations. Accordingly, the recommendations which appear below embrace, in addition to proposals for national action, a broad framework which could guide the activities of the Disaster Relief Coordinator. No mention has been made, however, of the existing international machinery and co-operation during and after the occurrence of natural disasters which should in any case be strengthened.

2. More specifically, these recommendations cover the following essential elements of a plan of action designed to reduce losses from natural disasters:

(a) the intensive application of science and technology to the control and mitigation of natural disasters;

(b) pre-disaster planning and preparedness.

A. Control and mitigation

3. The control and mitigation of natural disasters require the establishment of machinery for prediction, communication and prevention.

(i) Prediction and communication

(a) Recommendation for national action

4. It is recommended that the attention of governments concerned be drawn to the need for action to improve the ability to determine where disasters are likely to occur and to communicate the relevant information to those concerned. More specifically:

- Improved knowledge of tectonics, seismicity and the earthquake mechanism could provide a scientific basis for predicting the time and location of single large earthquakes;
- Expanded use of mathematical modelling and numerical analysis could improve knowledge of tsunami (seismic tidal wave) build-up;
- A broad assessment is needed of the world flood problem. The primary need, especially in developing countries, is to define the regions which are most prone to flooding. Continued progress is required in developing models and techniques for gathering hydrological data;

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[1] E/4994

- Improvements are needed in the ability to predict the occurrence of storms, typhoons and cyclones;
- Improvements are also needed in the ability to predict secondary disasters, such as major outbreaks of disease resulting from natural disasters.

(b) Recommendation for international action

5. It is recommended that the Secretary-General in consultation with the appropriate bodies of the UN system:

- study the desirability and the feasibility to implement an international disaster warning system which would utilize the most appropriate combinations of such networks as:
  - . a global surface observation network
  - . a global synoptic observation network
  - . a global aviation observation network
  - . a global upper air observation network
  - . a global river and flood measurement network
  - . a global radar observation network
  - . a global seismic and tide measurement network
  - . a global satellite observation network.
- Ensure that an international warning system for natural disasters, if implemented, is related, wherever possible, to systems designed to monitor and/or predict man-made hazards or disasters and, as appropriate, secondary disasters;
- Arrange, in the context of the eventual establishment of an international warning system, for the closest collaboration and co-operation between the competent agencies of the United Nations system, including:

  the World Meteorological Organization (WMO)

  WMO's World Weather Watch Programme and its International Maritime forecasting and storm warning system, together with the artificial earth satellite, already provide the means for monitoring weather and climate on a truly global scale. WMO should take further action relating to river and flood measurement and forecasting.

and should further develop its tropical cyclones project for the protection of populations exposed to cyclone risks.

. the United Nations Educational, Cultural and Scientific Organization (UNESCO)

UNESCO has stimulated the creation of international and regional seismological centres; further centres are needed.

. The World Health Organization (WHO)

WHO should take further action where major disease outbreaks resulting from disasters could arise.

- Provide for co-operation and collaboration between the United Nations system and international and regional non-governmental organizations such as:

  . the League of Red Cross Societies

  . the International Tsunami Warning System

- Establish an international disaster communications system. However accurate and effective warning systems may be, the warning has still to be communicated to those concerned. To this end, the Office of Disaster Relief should carry out the following activities:

  . obtain information on, document, and evaluate all major natural disaster communications networks, including those operated by:

  .. governments
  .. the United Nations system
  .. the Red Cross Societies
  .. commercial organizations
  .. amateurs

  . define the requirements of distributing warning alerts for each specific type of natural disaster, including warnings for impending:

  .. floods
  .. tsunamis
  .. earthquakes
  .. hurricanes
  .. volcanic eruptions

  . define the requirements for rapid international communications and exchanges of critical, specialized information between offices responsible for preparing and issuing natural hazards warnings.

6. *It is further recommended that* UNDP, which has already assisted many of the projects outlined earlier, give priority to responding within country programmes to requests of Governments for natural disaster research centres and warning systems.

### (ii) Prevention

7. Many of the worst effects of natural disasters can be mitigated if appropriate preventive measures are taken.

#### (a) Recommendations for national action

8. *It is recommended that* the attention of governments concerned be drawn to the need for action in the following areas:

- *the adoption of structural measures such as*:
  - the development of improved building methods and "house types" for low-cost, earthquake-resistant, storm-surge and wind resistant, rapid-construction housing
  - flood control measures, such as detention reservoirs, levees, diversion channels, channel improvements, terracing, gully control, bank stabilization or revegetation, water shed management
- *the adoption of non-structural measures such as*:
  - planning measures and land-use zoning designed to guide the settlements of human populations away from hazardous areas
  - programmes of public information designed to show the nature of the hazard and of the required response
- *the adoption of a comprehensive approach to natural disaster*

  The evaluation by planning ministries and national planning boards of the full range of possible actions, combining technical with social and economic measures. As an example, programmes of diversion, or evacuation without adequate provision for resettlement, may fail to achieve any genuine improvement in living conditions.

#### (b) Recommendations for international action

9. *It is recommended that*

- the Secretary-General ensure that the United Nations system provide to governments a comprehensive programme of advice and support in disaster prevention. More specifically:

The question of disaster prevention should be seen as an integral part of the country programme as submitted to, and reviewed by, UNDP.

## B. Pre-disaster preparedness

10. A plan for emergency action is essential in all disaster-prone countries and desirable in others.

(a) Recommendations for national action

11. It is recommended that the attention of governments concerned be drawn to the need for emergency action plans. These should specify:

- organizational responsibilities: who is to take charge of what
  - . a role of armed forces or civil defence units
  - . role of voluntary agencies
- lines of communication and command;
- availability of emergency supplies;
- type and amount of external aid likely to be required in different contingencies.

(b) Recommendations for international action

12. It is recommended that the Secretary-General ensure that the United Nations system assist countries with their planning efforts. To this end:

- an international programme of technical co-operation should be developed, aimed at strengthening the capabilities of governments in the field of pre-disaster planning:
  - . key responsibility at the field level should lie with the resident representative of the UNDP who would:
    - .. impress upon the government the importance of disaster preparedness
    - .. assist, in conjunction with the representatives of the agencies concerned, in the necessary planning, training and other arrangements.
- through the Office of Disaster Relief, the agencies of the United Nations system such as FAO, UNESCO, WHO, ITU, WMO, UNDP, UNICEF, WFP should collaborate on a master plan and/or programme for co-operation in cases of natural disasters;

. international voluntary agencies and individual governments should be invited to participate in the preparation of such a master plan

.. governments should inform the Office of the assistance they might be in a position to provide through the United Nations system

. competent bodies within the United Nations system should review and appraise their own programmes in the light of the overall master-plan

- international agencies - especially UNICEF, WFP - should devise a plan for the stockpiling of food and supplies at the international, regional and national levels.

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# Environmental aspects of natural resources management

(subject area II)

only one earth

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## ENVIRONMENTAL ASPECTS OF NATURAL RESOURCES MANAGEMENT

(subject area II)

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## Chapter I

## AN APPROACH TO INTEGRATED RESOURCE MANAGEMENT

1. Man's use of natural resources is the indispensable means to maintaining and improving the human condition. In his use of natural resources, however, man has, until recently, been unable to foresee - far less to assess and take account of - the impact of his actions on his well-being, or even on the resources themselves. Historically, in many regions of the world soils have been depleted, forests cut down and oceans and lakes have served as sinks for man's wastes. Why then, has concern over the environmental aspects of natural resource use and management recently reached major national and international proportions?

2. What is new is the magnitude of the claim on the world's resources and, hence, on the environment as a whole, together with a new awareness of cause-and-effect relationships. That claim flows from unprecedented rates of population growth, swiftly rising incomes and per capita demand which - magnified by scientific and technological advances - imposes demands on natural systems which may exceed their capacity to respond. As a result:

(a) the impact on the environment is such that, for the first time, the question could legitimately be raised whether the life-support system of the planet might be damaged beyond repair;

(b) in some parts of the world, especially where consumers are better informed through improved communications and better supplied by rising levels of affluence, there is mounting concern that demand may - in the case of some resources - overwhelm the supply.

3. As long as the volume and nature of man's productive activities were small, the environment was, by comparison, large enough to assimilate the waste products of production and consumption. Economic systems were for the most part geared to channelling resources into productive uses without considering the flow of used objects and waste materials. Rather, in many countries economic incentives were so structured as to maximize disposal in the air, in water bodies and in other communal resources. Now that open access has led to overtaxing the assimilitative capacity of these resources, new initiatives are called for in modifying the conventional incentive structure so as to make it a tool to minimize pollution. The scale of the environmental impact also has a spatial dimension. National boundaries seldom constitute barriers

to the movement of pollutants. Those who live downstream or down-wind from a source of water or air pollution are directly affected, and the distances involved are often substantial. Moreover, the resources of areas outside national jurisdiction, such as the oceans, are being increasingly degraded. This aspect is discussed in greater depth in connexion with subject area III, identification and control of pollutants of international significance.[1]

4. In many countries, particularly the richer ones, rising incomes combined with the pressures of urban living have led to the expectation of improved amenity values. As attention has increasingly turned to these aspects of life, the supply of such amenities has been found to be insufficient to accomodate the rapidly rising demand. Accelerated use threatens to degrade, in particular, choice locations. The preservation of open space is consequently given an importance equal to that which was attributed to more conventional uses (e.g. mining, highways, airports, industrial facilities).

5. Although arising in different contexts, in different countries, and with differing intensity, there is emerging a changing view of ultimate values. While this is perhaps most striking in the industrialized countries where the questioning of the pursuit of growth in its traditional form has reached significant proportions, evidence of change is available around the world. This has fed into the general stream of thought that emphasizes the importance of intangibles and of environmental values in particular. In the developing countries the reconsideration of traditional pursuits has focused greater attention on minimum acceptable living standards. Although rates of growth continue to be of paramount importance, concern is now voiced about the composition of output.

6. These, briefly, are among the principal issues that have brought about the worldwide concern with the state of the human environment, spilling over into a reconsideration of traditional concepts of resource management. It is imperative to view this concern within the broader framework of the biosphere.

(a) the biosphere is a thin surface layer surrounding the earth that comprises living organisms and the terrestrial environment with which they exchange energy and matter. It can be seen as a system capable of intercepting radiant energy from the sun, converting it into chemical energy through photosynthesis and distributing this energy in such a manner as to ensure the maintenance of the biosphere's functional structure. The survival on earth of living organisms, including man, thus depends not only on the photosynthetic process itself, but also on the energy-exchange processes responsible for maintaining the functional structure of the biosphere;

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[1] A/CONF.48/8

(b) the biosphere contains many interacting parts. It is a mosaic of individual ecosystems, or self-contained entities, each comprising a living community and its inanimate physical environment;

(c) ecosystems can exist on many levels and in many sizes - a small pond, a vast river basin transcending national boundaries, the biosphere itself. Each has its own equilibrium and interdependencies within which energy and matter are circulated;

(d) a common set of processes permits the understanding and scientific management of the ecosystem. Photosynthesis and predation, decomposition and evaporation, adaptation and precipitation all take place at varying rates and in different quantities. The principles of carrying capacity, survival threshold, biological succession and resilience can be observed to assure the sustained yield of a particular resource;

(e) all ecosystems generally include primary producers such as green plants, consumers such as herbivores, predators of different orders, and decomposers. Green plants are instrumental in photosynthesis, herbivores and predators contribute to the distribution of energy and matter, and decomposers break down dead organic matter so as to make the mineral elements it contains again available to plants again. It is thus possible to develop a model from which to study the optimal use of an ecosystem and to predict the sources and timing of its possible degradation.

7. The fact that perturbations in remote and seemingly unimportant parts of the biosphere can trigger off a chain of cause-effect reactions that ultimately provoke profound changes in the entire system, has given rise to the operating concept of "integrated resource management". This means that in altering one element in the system - for the purpose of deriving an advantage in terms of either goods or services -

one would be well advised to understand the impact of that alteration upon the remaining components of the system. Moreover, one should carefully calculate what should be done to make the system or unit or community as a whole as productive as possible or, as a more modest objective, to prevent the benefits that the modification makes possible from declining and eventually collapsing because crucial links and "feedback circuits" have been interfered with or severed.

8. Although integrated resource management is a sound concept, it does not always readily conform to economic and social realities. Many people engaged in on-going activities do not easily understand and accept the notion of integration. This does not mean that the ecology has traditionally been ignored. On the contrary, many of these people conform, however imperfectly, with ecological principles. Thus, man must have done some things right. True, this has mostly been a matter of trial and error. Nonetheless, tillers of the soil the world over have learned to live with nature without ever having heard of an ecosystem. When they have failed to learn, they have lost the soil and often also the basis for their existence. But in most parts of the world, they have been the original practitioners of "integrated resource management". Demand pressures, however, are inexorably pushing producers to increase both the productive base and the yields they wrest from the resources. In that process it has become increasingly apparent that nature usually can be pushed just so far, before diminishing returns set in.

9. Where a complex system of human activities is already in operation, the introduction of integrated management naturally faces great difficulties. It may be able to intervene only gradually as opportunities open up through obsolescence or other changes of one component or another. Nonetheless, the openings for injection of the principle should not be underestimated; even in developed countries or areas the possibilities of introducing new concepts are frequently considerable. But their most fitting field of application can, of course, be found in the developing areas.

10. The principal elements of integrated management need to be defined. The planning, development and management of natural resources, can be most efficient when it is carried out in an integrated manner. This provides the greatest opportunities for maximizing the economic, social and environmental benefits which can stem from natural resource development. Moreover, it may allow maximizing benefits through the timing of project developments. In other words, a series of resource development projects executed in a carefully planned sequence can be advantageous both from an economic

and environmental viewpoint. In short, the environment itself should be treated as one of the variables to be included in the comprehensive planning and management of natural resource development.

11. Integrated management requires expanding the planning process, where the economy is suitably organized. It also requires a high degree of co-ordination in the management of sectoral activities. In some cases development will be guided by articulated national goals - economic, social, and environmental; in other circumstances, the experience which can be drawn from the development process itself, will yield guiding principles over time.

12. Land use planning, in accordance with intrinsic land capabilities and limitations, is a major tool of integrated resource management. Its use can reduce, if not avert, adverse environmental effects. Land inventories should be undertaken, where appropriate, to provide comprehensive surveys of the potential of land. Such surveys - including aerial surveys and remote sensing - can form one basis for land use and resource planning for agriculture, forestry, recreation, or wildlife, and may comprise a classification system which delineates the potential and constraints for each sector analysed.

13. Central to the integrated approach is the participation of specialists who can, between them, understand the full range of environmental elements and their dynamics while being equally sensitive to economic, social and cultural considerations. The process involved ranges from initial surveys, in the case of development projects, through feasibility studies, investment, management of the completed project and, very importantly, its subsequent evaluation in terms of the environmental impact it has had.

14. Integrated resource management need not require a massive reorganization of existing governmental institutional structures. Mechanisms providing for co-ordination and for promoting co-operation between existing institutions offer the most practical immediate courses of action. Such mechanisms could include inter-agency or intra-agency working groups, task forces drawn from several agencies to work together on a specific project, and liaison and exchange of information between governmental agencies concerned, about on-going and planned activities.

15. Certain basic institutions are, however, required at the national level and would need to be established where they do not exist. This applies particularly to agencies responsible for water and land use. In some cases, it may be best to establish new institutions with a functional, rather than a sectoral, focus. National institutions

responsible for integrated surveys of natural resources have been successfully established in a number of countries. Another organizational approach is to strengthen institutional mechanisms on a geographic basis. Many countries have given greater powers over natural resources to local administrative subdivisions, such as states and provinces. In this connexion river basin authorities have proved to be particularly effective.

16. It is important to appreciate that the foregoing sketchy blueprint is not yet widely practiced and is far from complete. Much additional research is needed in the techniques of integrated resource management, and the application of present knowledge is far from satisfactory in many parts of the world. Moreover, natural resource development and management have often failed to draw the necessary lessons from past failures or deficiencies, and too little attention has been devoted to a systematic analysis of completed projects to determine why they succeeded or failed in environmental terms. Overriding all such considerations is the concern that, given the pace at which pressures for production are mounting and causing productive systems to stress the limits of the biosphere, the margin for error is narrowing, both where development is far advanced and where it is in its early stages.

17. Once the meaning of the ecosystem concept and the importance of modifying this system in ways that will enable it to assist rather than vitiate productive activities has been understood, it becomes clear that existing production systems are not cast in ecological but in economic terms. The motivation of the producer is to combine his labour and certain inputs in such a way as to produce an output the value of which exceeds the sum of the inputs. The fact that in the course of his activity he may impinge on the ecology is taken as incidental. The producer is concerned with economizing or with seeking to make such choices among alternatives that will yield him a net "profit", by whatever name this may appear in a given economic system. Where the object is a large public undertaking, a development project, or some other large-scale activity, alternatives are, in the first instance, evaluated in terms of costs and benefits. Those that promise to yield a net benefit, receive further consideration, while those that do not must satisfy other criteria if they are to survive.

18. In the area of cost-benefit calculations, ecological considerations have had some of their earliest successes. Initially lumped under "intangibles", they have increasingly come to be explicitly recognized, even though it is very difficult to quantify them.

19. One advantage of economics is that, since everything is reduced to a common yardstick - a monetary unit of measurement of some kind - factors that in their original guise are incommensurable become commensurable. The common denominator permits a rough sorting out of available choices. It forces a substantial amount of discipline on decision-makers, without which conflicting aspirations and objectives would have to be reconciled wholly by means of what can be collectively called "political" arguments. Introducing monetary units conveniently narrows the area in which decisions have to be made on the more demanding basis of ultimate values.

20. In considering environmental effects, economic criteria permit a more rational view of trade-offs than would otherwise be possible. Trade-offs are important. It is a well-established fact that, as a certain reduction in environmental pollution or a certain level of environmental acceptability is achieved, further progress becomes increasingly costly. Economic, social, and environmental considerations must all be reviewed by a common measure. Difficult trade-offs must frequently be confronted. For example, one can scientifically manage a forest for sustained yield, while neglecting its aesthetic and recreational values. Thus trade-off decisions have to be made even in those cases that at first glance seem to meet integrated management criteria and to conform to ecological principles.

21. Instead of considering ecosystems as whole units and explicitly recognizing environmental considerations as parameters of decisions, public policies and private activities are still almost exclusively organized along sectoral lines. So is demand for products, and so are many professional and occupational classifications. Yet all these activities affect the environment through the demand they make on land, air, or water and through the modification of adjacent resources in the process of production. One cannot expect management to conduct operations aimed at producing goods and services, that do not simultaneously affect the resources involved and associated. Rather, the task of resource management is to provide a combination of production and rate of disturbance that enables the environment to retain its capacity to sustain the activity, and that furnishes society with the goods and services it requires.

22. In each of the sectors of Chapter II, environmental considerations may be viewed in a global, national, and local context. The nature of the action and the level at which it is taken will vary from one geographic perspective to the next. The constraints and capabilities of the biosphere are best understood at the global level. As its evolution clearly shows, the functional structure of the biosphere is very adaptable,

and many organisms have proved to be capable of performing similar functions. Man has taken advantage of this characteristic to modify the biosphere for his own benefit. The limit of the biosphere's capacity to adapt to these modifications may be approaching, however, and man must account for these limits in future resource development.

23. It is at the level of nations, however, that resources development, and its associated environmental considerations, are most meaningful. Despite the physical unity of the earth's biosphere, the world is a community of nations whose individual sovereignties must be respected. Each country attempts to identify its national goals, as conditioned by its social and cultural values and the stage of its economic development, and to review the supply and distribution of its natural resources in the light of these goals. Competing demands, including conflicts between short- and long-term considerations, will make reconciliation of objectives a difficult task. Resource use must ultimately be guided by society's objectives, although such objectives will frequently be conditioned by the availability and distribution of the resources themselves. Resource priorities will also shift over time, as social values change. What was yesterday a forest serving urban recreational needs might today be a source of timber and tomorrow converted to agricultural land. The face of each nation's landscape undergoes constant evolution. Whether transformed or maintained intact, however, the environmental value of the different parts of a nation's landscape should be appreciated. Savannah or forest, desert or pastureland, meadow or prairie, all perform unique functions that should be assessed before man introduces changes, especially irreversible ones. Marginal lands, for example, although frequently neglected as a resource are, in fact, instrumental in maintaining the ecological balance of a territory. They act as a buffer - for example, between deserts and croplands on the upper parts of a watershed and the alluvial plains - and provide multiple land use opportunities between areas where a single use is predominant.

24. The sub-national level - either regional or local - will usually provide the best unit for resource development indicated by national policy. The participation of the local community is necessary for first-hand information on land capabilities and for the inclusion of social considerations. Individual components of the national land inventory will require the scrutiny of local planning and management.

25. The inevitable burden on the environment, whatever the geographic scope may be, can be dealt with by a number of preventive measures. Recycling can reduce the demand on resources and diminish the mounting pressures on the world's air and water. The

environmental degradation arising from new technologies, suggests a reconsideration of the increasing substitution of synthetic for natural products. In balancing costs, careful attention must be given to include all factors. Costing systems can be modified to reflect the costs of adverse environmental impacts and thus to encourage less harmful processes. Finally, mention must be made of the possibility of re-directing or modifying growth itself. There are those, particularly in some of the more affluent nations, who believe that the orientation of production should be shifted to provide for more social services and amenities. Moreover, the fact that the high production levels of some of the industrialised countries already draw even more heavily upon the world's non-renewable resources, raises questions of adequacy for future production.

26. In one respect, Chapter II departs from the integrated approach. For reasons of convenience, recommendations are arranged under headings that reflect, with minor modifications, the conventional division by sectors of economic activity. Because policy formation and implementation continue to be very largely based along traditional sectoral lines, the Conference's agenda items were formulated and the material submitted along the same lines. Moreover, although the recommendations are directed to countries at all stages of economic development, the discussion is generally cast in terms of an ideal model which governments may modify as they find appropriate; but because the discussion is structured in a way which seems to imply that resource development is essentially starting afresh, it applies particularly to the developing countries.

27. Despite the inevitable differences among sectors and nations, however, all share the common need for an environmentally sound resource management, which will allow man to continue to reap the manifold benefits provided by resources while minimizing environmental costs.

## Chapter II

## SECTORAL RECOMMENDATIONS

### A. Agriculture and soils

#### (i) Considerations for action

28. AGRICULTURE IS A VITAL ACTIVITY FOR THE PROVISION OF MAN's FOOD SUPPLY

- Agricultural activities - farming and related agro-industries - occupy more than half of the world's population.
- Throughout much of the world, agricultural development has resulted in immeasurable benefits;
  - living conditions of farmers and the quality of the rural environment have improved
  - better agricultural products have been provided
  - the productive capacity of natural resources has been enhanced
  - these improvements have resulted primarily from the use of higher-yielding varieties and breeds, fertilizers, pesticides and other agrochemicals, improved land use planning and management practices and, in some areas, better supply of irrigation water and changes in land tenure systems;
- In other parts of the world, particularly the developing countries, further agricultural development is still essential to meet the increasing demand for food and to improve the conditions of rural life;
  - increasing populations and rising expectations lead to a demand for more food and other agricultural products
    - it is estimated that world food production will have to double by 1985.

29. THE INFLUENCES OF AGRICULTURAL ACTIVITIES ON THE ENVIRONMENT ARE SIGNIFICANT AND OFTEN INEVITABLE.

- Traditional agriculture has long been a major factor in maintaining and improving local natural resources and the environment, on which it closely depends.
- As the scale and rate of agricultural development increases, it becomes increasingly difficult to avoid harmful environmental side-effects which, if unchecked, could reduce the quantity and quality of the food production and detract from rural living conditions.
- Multiple changes are taking place in the agricultural landscape relating to the conditions of land use management.

30. ALTHOUGH SOME LAND RESERVES ARE NOT YET DEVELOPED, AGRICULTURE HAS BEEN INTENSIFIED AND EXTENDED BEYOND THE CARRYING CAPACITIES OF THE SOILS AND RESOURCES OF SOME AREAS.

- While the bulk of the earth's land surface is unarable, it is estimated that half of the 20 per cent covered by permanent pastures, meadows and forests could be cultivated.
- Of the remainder, it is estimated that 20 per cent is too cold, 20 per cent too steep, and 10 per cent lacks sufficient soil cover for cultivation. The balance is currently cultivated;
    - in order to avoid environmental degradation, however, the capabilities of these land reserves should be carefully assessed before use.
- In other areas agricultural development has taken place without regard for the diversity and inherent limitations of the land;
    - this is due to a lack of knowledge of land capabilities and, more particularly, to the insufficient use of available data and experience
    - this has resulted in the introduction of new crops and animal breeds without accounting for climate, soils, liabilities to disease, and requirements for technological inputs.
- The increased amount of agricultural inputs exceeds the present ability of many farmers to manage economically the production process on a sustained yield basis and to compensate at the same time for harmful environmental side effects.

31. PRESSURES UPON AGRICULTURAL RESOURCES ARE INCREASING FOR SEVERAL REASONS.

- Although over centuries subsistence farmers have acquired an intimate knowledge of local climate, soils, water, plants, and animals and of the maintenance of their productive capacities, the introduction of new agricultural technology and land use systems tends to make some of this knowledge and experience obsolete.
- It is becoming increasingly difficult for extension and other advisory services to educate farmers in appropriate agricultural practices and in the safe use of new technologies;
    - this is due to the large number of people and production units involved and the increasing rate at which changes are introduced into agriculture
    - the problem is particularly acute where new lands are brought under cultivation, where new crops, varieties or breeds of animals are introduced, or where irrigation is used.

- Dependence on market conditions and, in some countries, obsolete land tenure systems put additional constraints on the farmer and further limit his ability to manage economically his farm and at the same time maintain the productive capacity of its resources and the protection of the environment. Under these conditions, many farmers, especially in developing countries, cannot afford to make basic land improvements, and apply soil and water conservation practices.

32. ACCELERATED DEGRADATION AND DEPLETION OF BASIC AGRICULTURAL RESOURCES ARE RESULTING FROM THESE PRESSURES.

- Although some forms of natural resources degradation have always existed and can be found at all levels of agricultural practices, increasing problems are found throughout the world which substantially impair agricultural productivity and development. These include:

  . accelerated soil erosion by wind and water, loss of soil fertility, through leaching or depletion of nutrients and decrease in humus content, degradation of soil structure, increased soil salinity, alkalinity and waterlogging under irrigation

  . loss of useful genetic resources

  . conversion into poor croplands or depletion of some grasslands by overgrazing

  . local or regional modifications of climate through removal of forests and tree hedges, causing, inter alia, desertification in sub-arid areas

  . encroachment from urban and industrial areas and transport facilities on good agricultural lands

  . discharge of harmful wastes from urban areas and industries on to rural areas.

33. INTENSIVE AGRICULTURAL PRACTICES CAN PLACE A HEAVY BURDEN UPON THE ENVIRONMENT.

- Many agricultural systems, associating either intensive monoculture or animal husbandry with agro-industries, do not provide for the economical use of by-products and tend to accumulate wastes, the disposal of which becomes the source of major nuisances;

  . unused plant residues can sometimes serve as reservoirs for the spread of pests and diseases; or the burning of these residues instead of being recycled by composting or consumption by cattle, may lead to a decrease of humus content and of overall soil fertility and to other nuisances

  . intensification of livestock production often results inter alia in large concentrations of animal excreta and liquid effluents which may cause pollution of air and contaminate water bodies

  - processing industries discharge organic wastes and other effluents which, if uncontrolled, may be causes of air pollution and water contamination
    - they also, of course, improve the conservation and marketing possibilities of agricultural products.
- Intensive agricultural systems are also increasingly dependent on agro-chemicals, some of which can, when excessively or improperly used, be a major cause of pollution and contamination;
  - overdoses or misuse of some pesticides may contaminate and sometimes kill desirable plant and animal life, disrupt the prey-predator parasite ecological balance, induce pest resistance; or accidentally harm users
    - pesticides are usually essential, however, for the protection of crops and livestock under present conditions
  - dairy products, meat and fish may contain persistent residues of some wide-spectrum pesticides, which can be considered as harmful to man beyond certain levels of concentration
    - in some instances such contaminated foodstuffs have been declared unacceptable to certain markets
    - the use of some persistent pesticides has been banned or reduced in some countries
    - in many other cases, however, higher costs and insufficient knowledge and experience preclude the use of less persistent and more selective pesticides and other more sophisticated pest control techniques
  - when used on erodible lands or, as in some industrialized countries, applied in excessive quantities, fertilizers may contribute, although perhaps to a minor extent, to water pollution and may occasionally cause nitrate poisoning of drinking waters
    - they are, however, essential not only for higher yields but also for the improvement and conservation of soils
  - over-utilization or misuse of drugs and antibiotics, necessary for the conditions of highly intensive animal protection, can leave harmful residues in meat and dairy products
  - contamination of water by agro-chemicals is often more acute on erodible and irrigated lands
    - however, little is yet known about the actual contribution of agro-chemicals to pollution and about their effects on man and natural resources

- improper irrigation may result in salinization, waterlogging, and other problems

- high-yielding grain varieties in certain tropical and sub-tropical regions might possibly be more vulnerable to widespread disease, herald the disappearance of native genetic stocks, result in social dislocations and increase the adverse effects arising from the higher levels of pesticide and fertilizer use.

(ii) Recommendations for national action

It is recommended that governments give consideration to the following proposals:

34. GOVERNMENTS SHOULD DEVELOP AGRICULTURAL PLANS AND POLICIES TO ENABLE FARMERS AND AGRO-INDUSTRIES TO FULFIL THEIR RESPONSIBILITIES IN MAINTAINING THE QUALITY OF THE HUMAN ENVIRONMENT.

- Agriculture will need to be increasingly recognized as an activity of general public interest:
  - for supplying food and other essential products in sufficient quantity and of satisfactory quality
  - for ensuring the conservation of a large part of the natural resources and of the environment
  - for employment opportunities in order to avoid excessive urban concentrations
  - for maintaining and enhancing the quality and attractiveness of rural areas for recreation and as buffer zones between urban areas
  - for recycling wastes emanating from sources such as municipal sewage.
- At the planning stage, the adverse environmental impacts of development plans on agriculture and conversely the harmful environmental effects of agricultural development should be prevented.
- The local environment will have to be regarded as a functioning ecosystem within which agricultural development takes place and to which it adapts, and not the reverse;
  - the conventional preoccupation with agricultural outputs must be balanced by a consideration of inputs and their environmental implications.
- An ecological appreciation explains the need for various inputs beyond the capabilities of the individual farmer but required to maintain successfully an artificial equilibrium:

- . plant breeding programmes and the salvaging of threatened genetic resources
- . soil and water conservation measures
- . monitoring and control of soil, water, and plant contaminants
- . integrated controls of insects, weeds and other pests.

- Agricultural and soil institutions should play an increasing role in the assessment of land capabilities and in advising planners and designers of development projects.

- Agricultural development plans and investment programmes should make provision for the early implementation of those basic land improvement and soil conservation projects and facilities for waste disposal which individual farmers and agro-industries cannot afford to carry out by themselves.

- An important part of the agricultural planning process and other aspects of rural planning should be carried out at the local level so as to involve the farming community and enlist their participation in improving the quality of rural life.

35. GOVERNMENTS SHOULD CONDUCT SELECTIVE BASE LINE SURVEYS OF AGRICULTURAL AREAS WHERE BASIC AGRICULTURAL RESOURCES ARE KNOWN OR SUSPECTED TO BE SUFFERING ENVIRONMENTAL DEGRADATIONS.

- Prior to selecting priority areas, collection and review of available surveys, inventories and data should be made in order to identify specific sources of environmental degradation;

  - . subjects for study include loss of soil productivity; loss of useful genetic resources; depletion of grazing lands; recurrent destruction of crops, livestock and wild herbivores by pests, diseases, or pollution; accumulation of harmful agricultural wastes; and indications of climatic changes.

- More comprehensive interpretations of existing data should then be made to identify similar agricultural areas;

  - . inter-relationships among ecological conditions, types and intensities of land use and management practices, and problems of environmental degradation should all be depicted.

- On this basis, priorities for urgent actions of conservation and protection of agricultural resources and for additional surveys and research should be established;

  - . these should consider the areas where the productive capacity of the resources and the agricultural products are most affected or threatened by environmental degradations.

- Capabilities of existing institutions should be strengthened accordingly to undertake the action required.

- Additional inventories and surveys should then be continued by sectors in priority areas;

  . these should be developed by successive stages of approximation and detail

  . they should make provision for periodic joint compilation and interpretation, including consideration of environmental effects of agriculture on other resources such as air, water, aquatic resources and wildlife.

36. GOVERNMENTS SHOULD KEEP SYSTEMATIC RECORDS OF ENVIRONMENTAL PROBLEMS CAUSED BY OR AFFECTING AGRICULTURE USING THE ABOVE BASE-LINE SURVEYS.

- The existing agricultural institutions (e.g. research institutes, field stations and other services) should provide the necessary network for these monitoring activities.

- Special emphasis should be placed on surveillance of soil degradation and on early warning systems for pests, diseases and pollutants affecting crops, livestock and the quality of agricultural products.

37. GOVERNMENTS SHOULD STRENGTHEN BASIC AGRICULTURAL RESEARCH TO IMPROVE ECOLOGICAL UNDERSTANDING.

- Research should be undertaken in selected ecosystems and problem areas on the general subjects of:

  . the functioning and productivity of agricultural systems

  . the processes of degradation of land resources and contamination of agricultural products

  . the environmental effects of certain specific agricultural practices and agricultural inputs, particularly agro-chemicals

  . the relationship of climate to the above items.

- In addition, a variety of ecologically-sound management opportunities merit study:

  . the recycling of municipal wastes, including their detoxication, onto agricultural lands

  . multiple cropping in the tropics, including considerations of crop combinations and sequences, cover crops, fertilization and weed control

  . systems to re-utilize the wastes of agricultural runoff

  . integrated pest controls, including combinations of regulated pesticide use, cultural controls, crop diversification.

38. GOVERNMENTS SHOULD DIRECT THEIR AGRICULTURAL RESEARCH SERVICES AND FIELD STATIONS TO INCORPORATE ENVIRONMENTAL CONSIDERATIONS INTO THEIR PROGRAMMES OF INVESTIGATION AND EXPERIMENTATION.

- The findings of basic ecological research should be applied to the study, design, and experimentation of ecologically stable systems of land use and agricultural practices, particularly in tropical and subtropical areas, whereby:

  . the productive capacity of land resources can be maintained on a long-term basis

  . wastes can be disposed of or recycled in these systems without harmful effects on natural resources or on the environment generally.

- In testing various combinations of crops and/or livestock, agricultural inputs, and management practices and in attempting to maximize yields or economic returns, experiments should be designed to assess:

  . possible environmental side-effects of run-off, erosion, and other forms of soil degradation and of the accumulation of harmful residues, especially those from agro-chemicals

  . the technical ability of local farmers to introduce new land use practices without causing deterioration to agricultural resources and the environment

  . the economic feasibility of implementing agricultural practices which can better protect the resources and the environment without adding to farm management costs. To this end, special investigations should be undertaken to evaluate the costs and long-term benefits of environmental protection practices in agriculture.

- Agricultural research institutions should, wherever feasible, use radioisotopes and radiation techniques to develop new, safer and more efficient management practices;

  . this applies particularly to the application of fertilizers, pesticides, and irrigation water and to the biological control of pests.

39. GOVERNMENTS SHOULD DEVELOP AND FACILITATE INFORMATION EXCHANGE AND TRANSFER OF EXPERIENCE IN AGRICULTURE WITHIN AN ECOLOGICAL FRAMEWORK.

- The transfer of information and experience in agriculture should be based upon similar ecological conditions, especially climate and soil.

- Within this framework, relevant and selected information should be made readily available to potential users (e.g. planners, extension services, farmers) in a form easily understandable and applicable, on:

  - soils, their characteristics, capabilities, and limitations for different uses
  - genetic resources, their requirements, potential resistance to pests and other adverse factors
  - agricultural practices most suitable for both increased production and minimum environmental damage, particularly soil conservation practices and integrated pest control techniques
  - most appropriate methods of agricultural waste disposal and recycling under local conditions.

40. GOVERNMENTS SHOULD INTRODUCE ENVIRONMENTAL CONSIDERATIONS INTO THEIR PROGRAMMES OF AGRICULTURAL EDUCATION AND TRAINING

- More emphasis should be placed on the creation of an understanding of:
  - the vital role of agriculture for man's welfare and for the maintenance of environmental quality
  - the environmental problems related to specific management practices, particularly those related to soil conservation and pest control
  - the limits to the carrying capacities of natural resources under particular farming or grazing conditions.
- These considerations should be introduced at all levels of training and education.

41. GOVERNMENTS SHOULD INTRODUCE AN INSTITUTIONAL AND LEGISLATIVE FRAMEWORK WHICH ACCOUNTS FOR THE ENVIRONMENTAL DIMENSIONS OF AGRICULTURAL DEVELOPMENT

- Soil and agricultural institutions should be directed to consider the ecosystem as an operative unit in the management of air, soil, plant, and water resources;
  - land settlement, agrarian reforms, and land consolidation should recognize local diversities of soil and climate
    - .. the extension and intensification of agriculture should be modified accordingly.
- Land use capabilities should serve as a basis for land zoning, land use legislation, licensing and regulations;
  - measure should be designed to respond to degradation resulting from misuse of croplands, misuse of agricultural inputs, and from the careless disposal of agricultural wastes.

## 42. GOVERNMENTS SHOULD CONSIDER THE NEEDS TO PROVIDE INCENTIVES AND ASSISTANCE TO FARMERS AND AGRO-INDUSTRIES

- Measures could include, depending on a given country's social and economic system, credit, better marketing facilities, tax reductions or exemptions, and subsidies in cash or in kind.

- Such measures would induce or enable recipients to undertake necessary actions to prevent or correct environmental degradation of general public interest caused by their activities.

- Examples would include soil conservation, use of more selective pesticides, and recycling of wastes.

## 43. GOVERNMENTS SHOULD ESTABLISH OR STRENGTHEN NATIONAL PROGRAMMES OF CONSERVATION OF SOIL RESOURCES

- According to local conditions and requirements, these programmes may place emphasis on one or more of the following areas:

  . rain fed crop lands, particularly dry farmed areas

  . irrigated lands with salinization, alkali and waterlogging hazards

  . erosion along rural roads and highways

  . grazing lands, particularly in arid areas

  . wind erosion, stabilization of sand dunes

  . watershed protection and afforestation

  . marginal lands, i.e. those areas falling between lands where intensive agricultural production is feasible and those unfit for agriculture and requiring protection.

- The programme should be integrated with the actions proposed earlier on base line surveys, research, assessment of land capabilities, assistance to land use planning authorities, development of ecologically stable agricultural systems, soil conservation legislation, extension work and assistance to farmers;

  . as such, it will go well beyond the mere promotion of soil conservation, erosion control practices, and land improvement works.

- A number of specific measures might possibly be employed:

  . erosion might be controlled through the use of various forms of mulches, primarily in the form of crop residues; engineering and agronomic techniques to stabilize the soil and lessen the erosive force of wind and water; control of fires; overgrazing, and deforestation; reseeding; and terracing

  - salinity and alkalinity control might employ knowledge of a plant's salt tolerance, the salinity of the water used for irrigation, and the soil characteristics for adequate irrigation and leaching
  - the leaching and depletion of soils particularly in the tropics might be reduced through controlling the intensity of agricultural use, by providing fallow periods, by introducing horticulture or pasturage instead of short-cycle crops, or by the use of appropriate fertilizers.

- Particular attention should be given in erosion control programmes to reducing sediment delivery to streams, reservoirs, dams and other water bodies in order to control physical, chemical and biological effects of these sediments on water quality and aquatic resources.

- A special fund for the conservation of national soil resources may be needed to provide the necessary focus and means of action.

- National soil institutions should be strengthened by reinforcing the soil conservation services and establishing, where needed, special units for land evaluation.

44. GOVERNMENTS SHOULD CONSIDER THE POSSIBILITIES OF RECYCLING AGRICULTURAL WASTES

- To the extent practicable and safe, animal or organic agro-industrial and municipal wastes could be used as fertilizers.

- Likewise, crop residues could be used for composts or as animal feed.

- In either case, the wastes or residues could be distributed to improve the structure and fertility of the soil.

  - attention must be paid to guard against contamination of the soil resource and the spread of infectious diseases.

- Wherever not feasible, these wastes should be collected, treated and disposed of under controlled conditions in order to:

  - minimize pollution, contamination, fire and other hazards
  - maintain the attractiveness and salubrity of rural lands and streams.

45. GOVERNMENTS SHOULD INSTITUTE OR REINFORCE NATIONAL PROGRAMMES TO REGULATE THE USE OF PESTICIDES AND OTHER BIOCIDES AND TO DEVELOP INTEGRATED PEST CONTROL

- Basic research is required on the fate and effects of pesticide residues in the environment and on their toxicity to man and other species.

- Because of the recognized toxicity, persistence, and mobility of pesticides, particular care should be given to their efficient use.

- Varieties and breeds more resistent to pests and diseases should be developed.

- The hazards of pests and diseases should be evaluated before the introduction of new crops, breeds, or management practices.

- Pesticides which are more selective and do not leave harmful persistent residues should be developed.

- The introduction of new pesticides should be controlled by appropriate regulatory measures for testing, registration, labelling, marketing and utilization.

- Biological pest control techniques such as the use of sterile male viruses pathogenic to insects, introduction of prey species and others should be developed and promoted with careful consideration for their possible environmental consequences.

- Farmers should be trained in the safe use of pesticides and in integrated pest control techniques, including such management practices as proper selection; dosage, and timing and waste disposal techniques. Bodily damage to users might thereby be minimized.

(iii) Recommendations for international action

46. IT IS RECOMMENDED THAT FAO, IN COOPERATION WITH OTHER INTERNATIONAL AGENCIES CONCERNED, STRENGTHEN THE NECESSARY MACHINERY FOR INTERNATIONAL ACQUISITION OF KNOWLEDGE AND TRANSFER OF EXPERIENCE ON SOIL CAPABILITIES, DEGRADATION, AND CONSERVATION

- Cooperative information exchange should be facilitated among those nations sharing similar soils, climate and agricultural conditions;

  . the Soil Map of the World being prepared by FAO, UNESCO and ISSS should serve to indicate those areas among which transfer of knowledge on soil potentialities and soil degradation would be most valuable

  . this map should be supplemented by establishing international criteria and methods for the assessment of soil capabilities and degradations and by collecting additional data based upon these methods and criteria

    .. this should enable the preparation of a World Map of Soil Degradation Hazards as a framework for information exchange in this area.

  . information exchange on soil use should account for similarities in vegetation and other environmental conditions as well as those of soil. climate, and agricultural practices.

  . the FAO Soil Data Processing System should be developed beyond soil productivity considerations

    .. to include the above data and relevant environmental parameters;

    .. to facilitate information exchange between national soil institutions, and eventually soil monitoring stations.

- International cooperative research on soil capabilities and conservation should be strengthened and broadened to include:

  - basic research on soil degradation processes in selected ecosystems under the auspices of the Man and Biosphere Programme

  - applied research on soil and water conservation practices under specific land use conditions with the assistance of FAO and, where appropriate, other agencies (UNESCO, WHO, IAEA)

  - research on using suitable soils for waste disposal and recycling

    - UNIDO, FAO and WHO should enter into joint consultations regarding the feasibility of an international programme in this area.

- These efforts for international cooperation in research and information exchange on soils should be closely associated with those of the UNDP-WMO-FAO-UNESCO programme of agricultural bio-meteorology, in order to facilitate integration of data and practical findings and support national programmes of conservation of soil resources recommended above.

47. IT IS RECOMMENDED THAT GOVERNMENTS, FAO AND WHO, IN COOPERATION WITH UNESCO AND IAEA, STRENGTHEN AND COORDINATE INTERNATIONAL PROGRAMMES FOR INTEGRATED PEST CONTROL AND REDUCTION OF THE HARMFUL EFFECTS OF AGRO-CHEMICALS

- Existing international activities for the exchange of information and cooperative research and technical assistance to developing countries should be strengthened to support national programmes described above, with particular reference to:

  - basic research on ecological effects of pesticides and fertilizers (MAB)

  - use of radio-isotope and radiation techniques in studying the fate of pesticides in the environment (joint IAEA/FAO Division)

  - dose and timing of fertilizers' application and their effects on soil productivity and the environment (FAO)

  - management practices and techniques for integrated pest control, including biological control (FAO/WHO)

  - establishment or strengthening of national and regional centres for integrated pest control, particularly in developing countries (FAO/WHO).

- Existing expert committees of FAO and WHO on various aspects of pest control should be periodically convened to:

  - assess recent advances in the relevant fields of research mentioned above

  - review and further develop international guidelines and standards with special reference to chlorinated hydrocarbons, pesticides containing heavy-metals, and the use of biological controls.

- In addition, ad hoc panels of experts should be convened, by FAO, WHO and, where appropriate, IAEA, in order to study specific problems, and facilitate the work of the above committees.

48. IT IS RECOMMENDED THAT FAO UNDER ITS PROGRAMME "WAR ON WASTE" PLACE INCREASED EMPHASIS ON CONTROL AND RECYCLING OF WASTES IN AGRICULTURE

- This programme should assist national activities recommended above relating to:

  . control and recycling of crop residues and animal wastes

  . control and recycling of agro-industrial waste

  . use of municipal wastes as fertilizers.

## B. Forests

### (i) Consideration for action

49. FORESTS ARE AMONG THE LARGEST, MOST COMPLEX, AND MOST SELF-PERPETUATING OF ALL ECOSYSTEMS

- They cover about one-third of the world land area.
- They constitute one-half of the world land biomass.

50. THE ENVIRONMENTAL AND PRODUCTIVE VALUE OF FORESTS IS SIGNIFICANT

- At the world level,
    - they have a direct and beneficial influence on all parts of the biosphere as a result of photosynthesis, heat capacity, conductivity and reflectivity, aero-dynamic roughness, influence on the water cycle, and emissivity in the infra-red band
    - they act as buffer zones between man-made ecosystems
    - they represent half of the world's photosynthetic fixation of carbon from the atmosphere, with its concurrent release of oxygen
    - they serve as the source of wood and wood products
    - they harbour valuable wild plant and animal species
- At local levels, they contribute to:
    - regulation of water catchment and release
    - protection of soil against erosion by wind and water and against other forms of soil degradation
    - protection of wildlife
    - recreational resources
    - improvement of living conditions both in and around human settlement through:
        - the control of nuisances such as noise and air pollution
        - improve aesthetics
        - psychological relief
        - provision of shade, particularly in the tropics

- . agricultural protection and improvement when introduced as shelter belts and windbreaks
    - .. trees serve to moderate wind velocities and improve the micrometeorological and soil moisture conditions in adjacent fields

51. FORESTS ARE SUBJECT TO INCREASING PRESSURE FROM COMPETING FORMS OF LAND AND FOREST USE

- The total demand for forest products is expected to double by 1985.
- Clearing forests is often considered a pre-requisite for economic development in countries where large forest tracts still exist. Pressure increases from:
    - . the demands for more agricultural land - particularly in the tropics where shifting cultivation is increasingly practised
    - . the establishment of new human settlements
    - . the development of water impoundments, transportation systems, etc.
- The world's forestry resources are shrinking at an alarming rate;
    - . in Latin America, between 5 and 10 million hectares are felled annually for agriculture
        - .. while the felling of trees and the "slash and burn" techniques of shifting agriculture are not always undesirable, their dimensions and intensity now argue for careful control and management.

52. SOME AREAS ARE BETTER ABLE TO COPE WITH CONFLICTING DEMANDS ON FORESTS THAN OTHERS

- In some areas, other needs can be satisfied without reducing the long-term productive capacity of forests and without deteriorating other natural resources or the environment in general;
    - . recreation, grazing, and aesthetic considerations usually constrain timber production, however,
- in other areas, such as tropical regions, arid regions, regions of dense population or adjacent to major industrial concentrations, forest depletion and degradation are taking place at an accelerated rate;
    - . adverse changes in micro-climates, soils, and water cycles sometimes result

- both the quality of the environment and the productive capacity of other natural resources are then affected by:
  - .. local and possibly regional changes in climate
  - .. the increased frequency of floods
  - .. accelerating soil erosion by wind and runoff, and subsequent silting of water bodies
  - .. the destruction of the natural habitat of wildlife.

53. FOREST-BASED INDUSTRIES ARE CONSIDERED TO BE SUBSTANTIAL POLLUTERS OF AIR AND WATER

- The pulp and paper industry can place a particularly heavy burden upon the environment
  - the chemicals and organic matter in the waste liquid from the pulp mill are normally disposed of in adjacent water bodies
  - inorganic salts, mercury, and heat are all released
  - unpleasant odours and gases, some of which are toxic in concentrated forms, are produced
  - Sulphur dioxide, sulphides, and particulate matter are also released.
- Pollution - particularly noxious smoke and particulate contamination of the air - is also created by the mechanical woodworking industries such as sawmilling, plywood, particle-board and fibreboard manufacture.

54. INVENTORIES OF FOREST LAND AND RESOURCES SHOULD BE DEVELOPED OR EXPANDED

- Consideration should be given to low-cost aerial remote sensing techniques and to improved information on wood volumes and values, non-wood products, ownership, productivity, and trends of land use.

55. THE ENVIRONMENTAL VALUE OF FORESTS SHOULD BE INCLUDED AS AN IMPORTANT ELEMENT OF ANY LAND USE POLICY

- Competing demands on forest lands should be reconciled;
  - frequently, the use of forest lands for other purposes, such as agriculture or human settlements, will be judged more important, and the lands will be cleared
  - it is essential, in any case, that the costs and benefits be carefully analyzed and alternatives examined before trees are felled.

56. FOREST MANAGEMENT SHOULD RECOGNIZE THE VALUE OF FORESTS IN PROTECTING OTHER NATURAL RESOURCES AND IN ENHANCING THE ENVIRONMENT, AS WELL AS IN PRODUCING TIMBER

- The traditional production orientation of forest management should be modified to meet these newly recognized demands and to provide multiple-uses;
  - . it should be remembered, however, that whether public or private, forests should be at least economic
- Forest legislation and institutions should be revised accordingly
- The vulnerability of drastically changed forest ecosystems should be recognized.

57. VARIOUS SYSTEMS OF MANAGING FORESTS HAVE BEEN DEVELOPED AND SHOULD NOW BE APPLIED

- These concern the method of regenerating the forest crop, the form of the crop produced, the orderly arrangement of the forest in accordance with silvicultural and protective considerations and the economic and aesthetic value of the trees produced.
- Relevant developments in management science include the application of operation research methods to forestry (linear programming, simulation, etc.).

58. THE DYNAMIC POSSIBILITIES OF BREEDING AND FARMING TREES SHOULD BE DEVELOPED

- Opportunities are emerging as forest genetics produce superior strains, fertilization of forests becomes commercially feasible, and soil and fertility research are expanded.

59. URBAN SILVICULTURE SHOULD BE AN IMPORTANT ELEMENT OF ANY NATIONAL PROGRAMME FOR THE DEVELOPMENT OF FORESTRY

- The breeding and propagation of trees suitable for the congested, more-or-less polluted urban environment would provide important psychological, aesthetic and anti-pollution relief.
- The provision of shade is an important consideration in the tropics.
- Attractive landscapes through the use of properly selected tree plantings should be planned in any development scheme.

60. THE OPPORTUNITIES FOR MANAGING FORESTS UNDER PUBLIC OWNERSHIP SHOULD BE FULLY EXPLOITED

- Approximately 70 per cent of the world's forests are under public ownership, where the possibilities for intensive and integrated management increase proportionately.

61. THE NECESSARY ECONOMIC ADJUSTMENTS TO CONTROL POLLUTION CAUSED BY FOREST INDUSTRIES SHOULD BE INTRODUCED

- Technologies are now generally available to control or eliminate pollution;
  - . the expenditure involved, although substantial, is increasingly considered both feasible and necessary
  - . less costly technologies should be developed.

(ii) Recommendations for national action

It is recommended that national governments give consideration to the following proposals:

62. GOVERNMENTS SHOULD UNDERTAKE BOTH BASIC AND APPLIED RESEARCH FOR IMPROVED FOREST PLANNING AND MANAGEMENT

- Considerable knowledge already exists, particularly as relates to forest ecosystems and management in the temperate zones, that should be collected, evaluated, and applied where practicable.
- General research needs, particularly in the tropical and subtropical areas, relate to:
  - . the functioning of "natural" and man-made forest ecosystems
  - . the mechanisms responsible for favourable or unfavourable influences of forests and forestry on other natural resources and on the environment
  - . the qualitative and quantitive effects of these mechanisms
    - .. both genetic and economic considerations require development.
- Research priorities in the tropics should be assigned according to the functions which require further knowledge;
  - . Immediate supplies of timber represent man's primary need, and vast tropical forest areas require management

  - .. scientific knowledge of the life histories and growth requirements of trees and forests, upon which forest management is based, is largely lacking in the tropics. Research is needed on such processes as ecological succession, energy conversion and nutrient cycling before adequate management systems can be devised or their effects predicted

  - .. research on the identification and potential uses of tropical timber trees must still take place in many cases, as must further study on the strength, density, chemical and other properties of such timber

  - .. soil and water of tropical forest lands, causing problems after forest removal that are intensified by high temperatures and heavy precipitation, must be studied for prediction, correction and prevention

  - .. knowledge of the tropical rainforests, particularly the multi-storied hardwoods, is especially lacking

  - .. research on forest resource survey methods and techniques is required

- . the introduction or improvement of new species is of high priority of forest management

  - .. research is required to determine which tropical tree species are quick growing and most suited to intensive culture for early yields

  - .. insect and disease problems in the biotically-rich tropical forests must be anticipated, and means of prevention and control studied

- . the more effective use of forests and trees for the environmental improvement of human settlements in the tropics must also be studied

  - .. the benefits of trees to urban areas are potentially very high in the tropics, particularly because shade is so critical for daytime comfort.

- Both present and future knowledge should be applied to develop multipurpose sylvicultural methods that meet the demand for both increased production and environmental protection and improvement;

  - . although knowledge of the basic components - including their ecology and genetics - is often sufficient in the developed countries, management systems for their integration are frequently lacking

  - . specific research is required for:

- .. the definition and standardization of criteria and methods for the economic appraisal of forest influences and for the comparison of alternative uses
- .. the preparation of guidelines - to be periodically updated - for environmental forest management.

- The potential contribution of different tree varieties to urban beauty, sound abatement, atmospheric quality, and temperature amelioration is poorly understood and underutilized and requires further study.

- Research should be initiated on the laws, land tenure systems, and forest institutions now in use in order to find the combination that will ensure safe and profitable multiple uses of forests;

  . research might be conducted along the following lines:

  - .. studies on the influence of land tenure systems on the protective and recreational role of forests
  - .. research on the development of public administration for environmental forestry
  - .. the revision of current education and training programmes to accommodate new techniques of forest resources management
  - .. comparative study, research and training in forestry legislation, wherever needed.

63. GOVERNMENTS SHOULD DEVELOP FOREST POLICIES AND PLANNING AS PART OF AN OVERALL POLICY FOR THE RATIONAL AND INTEGRATED USE OF NATURAL RESOURCES

- Particular attention should be given to the rapidly increasing demands for and benefits from amenities which forests provide.

- Forest zoning should be used as a basis for planning and management of forests and should be strengthened by adequate legislation and law enforcement.

- Land use planning commissions both in rural and urban areas should seek the advice of environmental foresters to improve the appearance of urban and rural landscapes and reduce hazards of pollution and other nuisances by rational use of tree plantations.

- Technology is needed to minimize damage to forests caused by fire, insects and diseases;

  . means for fighting forest fires and pests, integrated pest control systems, and early detection and evaluation techniques should be developed.

64. GOVERNMENTS SHOULD DESIGN ENVIRONMENTAL FOREST MANAGEMENT TO MEET THE COMPETING DEMANDS ON FOREST RESOURCES

- Modern forest management concepts, including multiple-use where desirable, should be introduced wherever feasible and in accordance with local conditions. Legislative and institutional provisions should be made, and accounting the budgeting procedures should be adjusted, to reflect the costs and benefits of the amenities which forests provide.

- Special measures should be taken to ensure that the introduction of intensive forest management techniques and the extension of manmade forests will not cause the disappearance of useful forest genetic resources and of wildlife or seriously impair soil and water values.

- Prevention and control of forest fires, pests and diseases should be given high priority.

65. GOVERNMENTS SHOULD INTRODUCE MINIMUM MANAGEMENT PLANS WHERE NONE CURRENTLY EXIST AND GOVERNMENTS ALREADY COMMITTED SHOULD INCREASE THEIR EFFORTS

- The opportunities of increasing public ownership and improving management of publicly-owned forests should be explored.

- Attempts should be made to settle shifting cultivations to control the use of fire, and to demarcate forest resources.

- Pilot projects using advanced management systems should be introduced into the developing countries, with appropriate assistance from the international community.

(iii) Recommendations for international action

66. It is recommended that the Secretary-General take steps to ensure that:

(a) THE UN BODIES CONCERNED CO-OPERATE TO MEET THE NEEDS FOR NEW KNOWLEDGE

- Where appropriate, research should be promoted, assisted, co-ordinated, or undertaken by the Man and Biosphere Programme (UNESCO), ICSU, or IUFRO, in close co-operation with FAO and WMO.

- Studies on comparative legislation, land tenure, institutions tropical forest management, and the effects of the international trade in forest products on national forest environments, and public administration, might be sponsored or co-ordinated by FAO, in co-operation with other appropriate organizations.

(b) CONTINUING SURVEILLANCE OF THE WORLD'S FOREST COVER IS PROVIDED FOR THROUGH THE ESTABLISHMENT OF AN APPROPRIATE MONITORING SYSTEM

- Such a World Forest Appraisal Programme would provide an indication of global environmental stability;

- the balance between the world's forest biomass and the prevailing environment would be continuously measured

- changes in the forest biomass, considered to have a significant impact on the environment, would be recorded.

- The information could be collected from existing inventories and on-going activities and through remote sensing techniques.

- The forest protection programme described above might be incorporated within this effort, through the use of advanced technology, such as satellites using different types of imagery and which could constantly survey all forests.

67. It is further recommended that FAO

(a) CO-ORDINATE AN INTERNATIONAL PROGRAMME FOR RESEARCH AND EXCHANGE OF INFORMATION ON FOREST FIRES, PESTS, AND DISEASES

- The programme should include data collection and dissemination, identification of potentially susceptible areas and of means of suppression; exchange of information on technologies, equipment and techniques; research, including integrated pest control and the influences of fires on forest ecosystems, to be undertaken by IUFRO; establishment of a forecasting system in co-operation with WMO; organization of seminars and study tours; the facilitation of bilateral agreements for forest protection between neighbouring countries, and the development of effective international quarantines.

- Forest fires, pests and diseases will frequently each require separate individual treatment.

(b) FACILITATE THE TRANSFER OF INFORMATION ON FORESTS AND FOREST MANAGEMENT

- The amount of knowledge that can be usefully exchanged is limited by the differences of climatic zones and forest types.

- The exchange of information should however be encouraged among nations sharing similarities;

  - considerable knowledge is already exchanged among the industrialized nations of the temperate zone.

- Opportunities exist, despite differences, for the useful transfer of information to developing countries on the environmental aspects of such items as:

- the harvesting of some tropical hardwoods
- pine cultures
- the principles of forest management systems and management science
- soils and soil interpretations relating to forest management
- forest industries pollution controls, including both technical and economic data
- methods for evaluation of forest resources through sampling techniques, remote sensing, and data processing
- control of destructive fires and pest outbreaks.

## C. Wildlife, parks and other protected areas

### Part One: Wildlife[2]

### (i) Consideration for action

68. WILD ANIMAL LIFE IS A NATURAL RESOURCE OF GREAT VALUE TO MANKIND.

- It contributes to the normal functioning of all natural biotic communities and ecosystems upon which the health and productivity of the biosphere depends and it also reflects the health of the biosphere itself.

- It has economic value as an attraction for tourism and for outdoor recreation activities.

- It serves as a source of protein, hides, furs and other animal products which may be harvested on a sustained basis if properly managed.

69. THROUGHOUT THE WORLD, GREATLY INCREASED PRESSURE ON WILD ANIMAL LIFE THREATENS THE SURVIVAL OF MANY SPECIES OF GREAT PRESENT AND POTENTIAL VALUE.

- Expanding human populations and land use practices incompatible with the maintenance of stable wildlife habitats are contributing to the deterioration of these habitats.

- The increasing use of pesticides and other pollutants threatens the existence of certain birds.

- Poaching and exploitation for trade sometimes deplete species below minimum levels of self-regeneration.

- It must be noted, however, that in many instances wildlife has proved to be compatible with man and his land uses, or that modifications in land use sometimes benefit wildlife;

  . many stocks, such as deer in the United States or saiga antelope in the USSR, have increased dramatically through scientific management.

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[2] The topic of this chapter has been restricted to wild animal life. The general character of the considerations and recommendations for wild plant life would be similar. Although it could be argued that the conservation of wildlife is inherently an international concern, the distinction between national and international recommendations has been retained. Apart from conservation itself, wildlife management for aesthetic, recreational or economic objectives clearly addresses itself to national treatment.

70. WHALES ARE A COMMON MARINE RESOURCE OF CONCERN TO ALL MANKIND, AND ARE IMPORTANT IN MAINTAINING THE HEALTH AND STABILITY OF THE MARINE ENVIRONMENT

- The population of many species of whales has declined in the last few decades. The IUCN Book of Endangered, Rare and Depleted Species lists several whale species as in danger of extinction.
- Other aquatic mammals such as dolphins and porpoises are also becoming endangered due to prevailing fishery practices.

71. WILDLIFE MUST BE CAREFULLY MANAGED AS AN IMPORTANT RESOURCE. ITS POPULATIONS MUST BE AS LARGE AND AS VARIED AS IS COMPATIBLE WITH OTHER IMPORTANT LAND USES.

- In formulating policies for management, it is useful to distinguish between endangered or depleted species and those of potential economic benefit.
- It is also important to recognize that the bulk of wildlife populations are found on land already being used by man for another purpose;
- The use and preservation of wild animal resources must be reconciled with conflicting activities of mankind so that maximum long-term interests are assured.
- Wildlife's value for tourism, sport and game cropping must be fully realized in the short term and should be maintained over time;
  - large populations of wild animals exist on a local or regional basis in comparatively under-developed lands whose economic value remains to be developed.
- However, the health and diversity of wildlife species must be carefully safeguarded;
  - stable and protected habitats must be assured to provide for the survival of a variety of natural ecosystems and the wild animals that may still be found within their boundaries
  - the damaging effects of certain wild animals upon man's activities, such as destruction of crops and transmission of disease, must be reconciled with the benefits of such animals.
- Habitat management involves many approaches:
  - modified or artificial habitats can be provided to enhance wildlife populations following the best principles of scientific wildlife management
  - in other areas, where natural populations are abundant within natural habitats, attempts can be made to maintain the integrity of both.

72. WORLDWIDE ACTION IS REQUIRED TO ENSURE THE CONTINUING VALUE OF THE WILDLIFE.

- A worldwide inventory of wildlife resources and habitat is a prerequisite for any global involvement in appropriate management.

- Although wildlife management is a well advanced science in many of the industrialized countries, it is only in its infant stages in some parts of the developing world.

- This is particularly serious, for wild animals are in a most vulnerable position in the developing countries, where:

  - they have until recently lived under pristine conditions with no need to adapt to man's disruptive activities;

  - they are suddenly subjected to the unprecedented pressures of human populations.

(ii) Recommendations for national action

It is recommended that national governments give consideration to the following proposals.

73. EACH COUNTRY SHOULD ESTABLISH REGIONS OF NATURE RESERVES AND OTHER PROTECTED AREAS

- These areas should include adequate representation of all naturally occurring ecosystems, appropriate to the space and habitat requirements of the wild species involved.

- The management of these regions will require an understanding of habitat requirements, at present known for very few species.

- Assistance will frequently be required from the international community.

74. COUNTRIES SHOULD ENACT AND ENFORCE PROTECTIVE LAWS REGULATING THE HARVESTING AND MARKETING OF WILD ANIMALS AND THEIR PRODUCTS, TO GUARANTEE THAT POPULATIONS ARE NOT EXPLOITED TO A DEGREE THAT WOULD THREATEN THEIR SURVIVAL.

75. GOVERNMENTS SHOULD ALSO EXERCISE CAREFUL CONTROL OVER THE INTRODUCTION OF EXOTIC SPECIES INTO NEW AREAS WITH A VIEW TO PREVENTING THE DISPLACEMENT OF INDIGENOUS SPECIES.

- Where consequences are predictable, impacts should be considered before introducing the animals; where consequences are unknown, research will be required to predict the environmental effects of a given introduction.

- Each country should consider the establishment of an advisory board of experts which would be independent of local decisions and which could have access to the world wildlife scientific community.

76. METHODS FOR ASSESSING THE IMPACT UPON WILDLIFE OF BUILDING LARGE-SCALE CONSTRUCTIONS, OF CLEARING AND DEVELOPING LAND, AND OF ALTERING PRESENT FORMS OF LAND USE, SHOULD BE DEVISED AND IMPLEMENTED.

- Estimates of potential impact should be taken into account in the early planning stages of any development project.

- Where appropriate, intergovernmental organizations should co-operate in this assessment.

77. THE CONSIDERATION OF WILDLIFE RESOURCES AND OTHER HABITAT SHOULD BE INCORPORATED INTO LAND USE PLANNING AND DEVELOPMENT, PARTICULARLY IN RESPECT TO LONG RANGE CONSIDERATIONS.

- An evaluation should be made of the extent to which wildlife may interfere with adjacent forms of land use, complement existing forms of use by adding extra values, or be used as a major form of land use in its own right.

78. FACILITIES SHOULD BE DEVELOPED, PARTICULARLY IN THE DEVELOPING COUNTRIES, TO ATTRACT AND SERVICE TOURISM BASED ON WILDLIFE RESOURCES.

- Large potentials should be developed by first promoting and supervising hunting tourism and, subsequently, expanding the tourist industry by providing for wildlife viewing and necessary infrastructure.

- Governments, particularly those of the developing countries, should formulate demonstration cropping and hunting programmes for large game animals with substantial populations.

- Those projects underway in Africa should be extended, and new ones initiated in the Middle East, Latin America and Asia.

- Areas which should receive high priority are

  . those where present forms of land use have proved unsatisfactory

  . lands that are marginal to domestic animals, such as those frequently found in arid or adverse climates.

- More experimentation land research should be undertaken on the biological and economic advantages of game ranching, and on the most efficient producers of protein, as a basis for future action.

- Means should be examined and implemented to resolve the frequently occurring technical difficulties of harvesting, processing and marketing the meat;

  . demonstration pilot schemes for developing commercial utilization of game, underway in Zambia and Kenya, should be expanded.

79. RESEARCH IS NEEDED ON HABITAT REQUIREMENTS.

- This will contribute to the solution of many problems, ranging from those of species in danger of extinction to those of over-abundance of populations.

- It will respond to the need for knowledge on productive meat management.

- It will help determine the optimum size of areas and ensure high species diversity.

- Research should include methods of assessing changes in the plant and animal communities and animal diseases.

- The interaction of livestock with other forms of land use requires considerable study.

80. GOVERNMENTS SHOULD INITIATE OR EXTEND APPLIED RESEARCH PROJECTS TO ASSESS THE INTERRELATIONSHIPS BETWEEN FOREST AND RANGE MANAGEMENT AND WILDLIFE POPULATIONS.

- Different combinations of forest and range management practices and wild species should be tested to identify situations where each complements the value of the other.

### (iii) Recommendations for international action

It is recommended that the Secretary-General take the following steps:

81. ENSURE THAT THE EFFECTS OF POLLUTANTS UPON WILDLIFE ARE CONSIDERED, WHERE APPROPRIATE, WITHIN ENVIRONMENTAL MONITORING SYSTEMS.

- Particular attention should be paid to those species of wildlife which may serve as indicators for:

  . future wide environmental disturbances to other species

  . an ultimate impact upon human populations.

82. ENSURE THAT A PROGRAMME TO EXPAND PRESENT DATA GATHERING PROCESSES SO AS TO ASSESS THE TOTAL ECONOMIC VALUE OF WILDLIFE RESOURCE, IS ESTABLISHED.

- Such data would facilitate the task of monitoring the current situation of animals endangered by their trade value, and demonstrate to questioning nations the value of their resource.

- Such a programme should elaborate upon present FAO efforts and might well produce a yearbook of wildlife statistics.

83. ENSURE THAT THE APPROPRIATE UN AGENCIES COOPERATE WITH THE GOVERNMENTS OF THE DEVELOPING COUNTRIES TO DEVELOP SPECIAL SHORT-TERM TRAINING COURSES ON WILDLIFE MANAGEMENT.

- The priority should be on conversion courses for personnel trained in related disciplines such as forestry or animal husbandry.
- Special attention should be given to the establishment and support of regional training schools for technicians.

84. IT IS FURTHER RECOMMENDED THAT GOVERNMENTS GIVE ATTENTION TO THE NEED TO ENACT INTERNATIONAL CONVENTIONS AND TREATIES TO PROTECT SPECIES INHABITING INTERNATIONAL WATERS OR THOSE WHICH MIGRATE FROM ONE COUNTRY TO ANOTHER.

- A broadly-based convention might be considered which would provide a framework by which criteria for game regulations could be agreed and the over exploitation of resources curtailed by signatory countries.

85. IT IS RECOMMENDED THAT GOVERNMENTS MOVE TO AGREE TO THE PROPOSED CONVENTION ON THE EXPORT, IMPORT, AND TRANSIT OF CERTAIN SPECIES OF WILD ANIMALS AND PLANTS[3]

86. IT IS RECOMMENDED THAT GOVERNMENTS AGREE TO STRENGTHEN THE INTERNATIONAL WHALING COMMISSION AND TO CONSIDER AN INTERNATIONAL AGREEMENT CALLING FOR A 10-YEAR MORATORIUM ON COMMERCIAL WHALING.

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[3] This subject is treated in detail in Subject Area IV.

## Part Two: Parks and other protected areas

### (i) Considerations for action

87. NATIONAL PARKS AND SIMILAR PROTECTED AREAS ARE DESIGNED TO PROTECT IN PERPETUITY THOSE AREAS WHICH OUTSTANDINGLY REPRESENT THE BEAUTY AND DIVERSITY OF MAN'S HERITAGE

- These areas include:
  - large tracts of land set aside for the protection of wildlife and its habitat
  - areas of great natural beauty or unique interest
  - areas containing rare forms of plant and animal life
  - areas representing unusual geologic formations
  - places of historic and prehistoric interest
  - areas containing ecosystems of special importance for scientific investigation and study
  - areas which safeguard the needs of the biosphere.
- These areas serve a number of specific purposes:
  - some provide recreation for large numbers of people without seriously detracting from the natural values
  - some aim to retain their more pristine beauty through greater restrictions
  - others (strict nature reserves) are reserved solely for scientific research as relatively undisturbed environments
  - still others provide a reservoir of genetic materials in a spectrum of organisms adapted to a particular range of soil and climatic conditions.

88. THE NEED FOR THE EXTENSION OF PROTECTED AREAS IS BECOMING ACUTE IN MANY COUNTRIES

- Many national parks of high tourist value are being flooded by rising numbers of tourists and suffer from insufficient or inappropriate planning and management;
  - such parks, particularly in the developing countries, represent a major source of income which could be jeopardized if they deteriorate.

- Valuable wildlands are threatened by pressures detrimental to their protection and use;
    - damage frequently arises from a lack of understanding or interest, particularly in some developing countries, of the value of such wildlands
    - deterioration often results from a lack of knowledge, or political or economic considerations generally inhibiting or delaying the required action, until the parks exist on paper only
    - the possibilities of such deterioration increase whenever a park or otherwise protected area is shared by two or more countries.

89. THE PRESENT WORLD HOLDINGS OF PROTECTED AREAS MUST BE EXPANDED AS WIDELY AS POSSIBLE

- Efforts must be made to accommodate the pressures of exploding populations of both tourists and urban dwellers which are increasingly turning to the refuge of such areas.
- As many representative samples of ecosystems as is possible must be protected, before they inevitably disappear, for study, reference, preservation of species and future scientific needs.
- National park policy will vary considerably, however, with the stage of economic development.

90. PROTECTED AREAS MUST BE PLANNED AND MANAGED TO MAXIMIZE THEIR PRESENT AND FUTURE VALUE

- Maximum use of recreation and tourist resources must be provided while carefully observing the carrying capacity of each protected area.
- The rate and scale of development of new parks must be determined so as to guard against possible environmental problems;
    - parks can be managed, however, to accommodate heavy use.

(ii) Recommendations for national action

It is recommended that national governments give consideration to the following proposals

91. GOVERNMENTS SHOULD SET ASIDE WILDLAND WHEREVER POSSIBLE

- Policies which provide for the needs of tourism and recreation and for the protection of representative ecosystems should guide such action.

92. GOVERNMENTS SHOULD ENGAGE IN RESEARCH ON PARK MANAGEMENT, WITH PARTICULAR EMPHASIS ON:

- Assessing the recreational carrying capacity of individual ecosystems and subsequently the desirable rates and scale of their development as parks.

- Determining the optimum use for different protected areas, including the appropriate zoning for single or multiple use.

- Identifying the most appropriate means of organizing and managing large numbers of people within protected areas.

93. GOVERNMENTS SHOULD EDUCATE THEIR PEOPLES ON THE VALUE AND PURPOSES OF PROTECTED AREAS AND DESIGN MEANS TO USE PARKS AS AN EDUCATIONAL TOOL

- The concept that "parks are for the benefit and enjoyment of people" should be communicated, particularly in the developing countries.

- Educational tourism should be promoted within the services of protected areas.

94. GOVERNMENTS SHOULD ACCELERATE THE DEVELOPMENT OF RECREATIONAL FACILITIES WITHIN OR NEARBY URBAN AREAS

- Such action would relieve pressures on over-extended national parks.

- Measures of landscape planning such as cluster development of new housing areas and decontamination of polluted waters should be stressed.

(iii) Recommendations for international action

95. IT IS RECOMMENDED THAT GOVERNMENTS AND THE SECRETARY-GENERAL GIVE SPECIAL ATTENTION TO TRAINING REQUIREMENTS

- High level training should be provided and supported;

  . in addition to integrating aspects of national park planning and management into courses on forestry and other subjects, special degrees should be offered in park management

    .. the traditional forestry or geology background of the park manager must be broadened into an integrated approach

  . graduate courses in natural resources administration should be made available in at least one major university in every continent.

- Schools offering courses in national parks management at a medium grade level should be assisted by the establishment or expansion of facilities, particularly in Latin America and Asia.

96. IT IS FURTHER RECOMMENDED THAT THE SECRETARY-GENERAL TAKE STEPS TO:

ENSURE THAN AN APPROPRIATE MECHANISM EXISTS FOR THE TRANSFER OF INFORMATION ON PARK LEGISLATION AND PLANNING AND MANAGEMENT TECHNIQUES DEVELOPED IN SOME INDUSTRIALIZED COUNTRIES WHICH COULD SERVE AS MODELS TO BE MADE AVAILABLE TO ANY INTERESTED DEVELOPING COUNTRY

97. ENSURE THAT THE APPROPRIATE UNITED NATIONS AGENCIES ASSIST THE DEVELOPING COUNTRIES TO PLAN FOR THE INFLOW OF VISITORS INTO THEIR PROTECTED AREAS, IN SUCH A WAY AS TO RECONCILE REVENUE AND ENVIRONMENTAL CONSIDERATIONS

98. IT IS ALSO RECOMMENDED THAT GOVERNMENTS:

(a) TAKE STEPS TO CO-ORDINATE AND CO-OPERATE ON THE MANAGEMENT OF SHARED PROTECTED AREAS

- Agreement should be reached on such aspects as the rights of guards to follow poachers across international boundaries, mutual legislation, patrolling systems, exchange of information, research projects, collaboration on measures of burning, plant and animal control, fishery regulations, censuses, tourist circuits and frontier formalities.

(b) MOVE TO AGREE ON THE PROPOSED CONVENTIONS ON CONSERVATION OF CERTAIN ISLANDS FOR SCIENCE AND CONSERVATION OF THE WORLD HERITATE 4/

(c) TAKE STEPS TO SET ASIDE AREAS REPRESENTING ECOSYSTEMS OF INTERNATIONAL SIGNIFICANCE FOR PROTECTION UNDER INTERNATIONAL AGREEMENT

99. IT IS RECOMMENDED THAT INTERESTED GOVERNMENTS - WHICH HAVE NOT YET DONE SO - SIGN AND RATIFY THE CONVENTION ON CONSERVATION OF WETLANDS OF INTERNATIONAL IMPORTANCE, APPROVED AT THE CONFERENCE OF RAMSAR (IRAN) 5/

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4/ See also A/CONF.48/9.

5/ See also A/CONF.48/9.

## D. The Conservation of Genetic Resources

### (i) Considerations for action

100. IT IS IMPORTANT THAT THE WIDEST POSSIBLE DIVERSITY OF AND WITHIN SPECIES BE MAINTAINED.

- For the ecological stability of the biosphere.
- For use as natural resources.
- For their scientific, educational and recreational value.

101. THE SURVIVAL OF SPECIES, INCLUDING MAN HIMSELF, DEPENDS ON GENETIC DIVERSITY.

- The availability of broadly based gene pools is an essential condition for adaptation to environmental change, both natural and man-made, such as
  - the replacement of pesticides by genetic defenses
  - the adaptation of high-yield varieties to local conditions
  - the development of resistance to evolving parasites
  - the correction of nutritional defects, such as low content of protein or specific amino-acids.
- Genetic diversity is required to counter the inadaptability to local conditions that sometimes follows the introduction of highly selected animal species;
  - continual selection for specific traits within a breed or type sometimes dangerously reduces genetic variability.
- The full variety of microscopic organisms provides the indispensable link in the carbon and nitrogen cycles upon which all life depends;
  - micro-organisms include bacteria, yeasts, molds, algae, protozoa, and viruses
  - the quality and flavour of man's food and drink often depends upon beneficial bacteria and fungi
  - industry uses micro-organisms to manufacture chemical products including antibiotics
  - micro-organisms help man to understand the underlying causes of many pathological conditions
  - pollutant organic wastes are rendered harmless by the use of bacteria.

102. MAN'S IMPACT ON THE BIOSPHERE IS INCREASINGLY REDUCING THE GENETIC RESILIENCY OF MANY SPECIES.

- Not only agricultural plant varieties, but also forest species, aquatic organisms, and certain types of animals and micro-organisms are affected.

- Man's development - transforming and disrupting new areas for his use - is depleting or displacing valuable genetic resources. Wild species and primitive domesticates are lost.

- Areas in Asia, Latin America and Africa are threatened that have traditionally served as

    - the "centres of natural diversity" or the natural habitation of wild varieties

    - the source of genetic resources for plant improvement.

- Indigenous crops are replaced by new higher yielding varieties of greater genetic uniformity and less adaptability to local conditions.

- Many plant characters - protein quality, oils, unique growth habit, dwarfness, etc. - may someday be required but are being lost with the disappearance of wild species.

- The introduction by man of exotic diseases and insects poses a great risk to some of the world's gene resources;

    - for example, the chestnut blight has wiped out all but scattered remnants of the American chestnut tree.

- Also threatened are the outliers and remnants of forest species whose populations, often critical for breeding, can be substantially reduced and sometimes eliminated.

103. MANY OPPORTUNITIES, AS YET UNEXPLOITED, EXIST FOR THE DEVELOPMENT OF GENETIC RESOURCES.

- The opportunities for breeding improved strains which have been well recognized and developed should be continued and supported.

- Man must protect himself against his increasing dependence on a diminishing number of crops;

    - these will require new genetic inputs as they are introduced into local conditions demanding new elements of diversity

        - the 15 crops upon which he principally depends will require new genetic inputs as they are introduced into increasingly less favourable environments

  - genetically resistent varieties and hybrids offer great potential for overcoming damage and threats of extinction caused by insects and diseases.

- Opportunities for developing the world's forest gene resources for the purpose of genetic improvement are many and with the exception of a few species as yet unexploited;

  - this potential is amply demonstrated by the high productivity of North American pines when planted throughout the Southern Hemisphere.

- A selection of breeds, types, and varieties of mammals and birds could be intensively studied to assess their production potential.

- The employment of micro-organism germ plasms could be expanded to benefit many sectors of human activity such as;

  - the assembling of taxonomic type strains for reference purposes

    or

  - the preservation of unique mutant strains for fundamental genetic work.

- The availability of many unexploited species and races of aquatic organisms should be assessed for possible domestication.

104. BENEFICIAL INSECTS CAN BE DEVELOPED TO PROTECT PLANTS FROM THE THREATS OF PREDATION AND DISEASE AND TO ERADICATE UNDESIRABLE WEEDY PLANTS.

- Biological control - still in its infancy - can be vastly expanded through the establishment of insect gene centres and intensive breeding and experimentation.

- Likewise, strains better adapted as pollutants should be developed.

105. THE CONSERVATION OF GENETIC RESOURCES MUST RECEIVE URGENT ATTENTION IN ALL SECTORS.

- A diversity of gene pools must be maintained so as to assist current economic and social development.

- Genetic resources must be preserved for the evolving and unpredictable needs of future generations;

  - many species of no current and direct use to mankind will someday answer some of its future needs

  - the health of man's future environment requires a broad genetic base.

106. ACTION MUST PROCEED ON A WORLDWIDE BASIS, BECAUSE OF THE ENORMOUS RANGE OF SPECIES INVOLVED AND THE DIMENSIONS OF WORLD AGRICULTURE.

- Only a programme of international co-operation can work because
  - . those countries most actively engaged in advanced domestication and genetic resource conservation are usually remote from the origins of the species
  - . means must be assured, therefore, to assist developing countries through co-ordinating international activities
    - .. to establish conservation centres
    - .. to grant all countries access to basic breeding materials.

(ii) Recommendations for action

IT IS RECOMMENDED THAT GOVERNMENTS, IN CO-OPERATION WITH THE SECRETARY-GENERAL AND FAO WHERE INDICATED, TAKE THE FOLLOWING STEPS.

107. AGREE TO AN INTERNATIONAL PROGRAMME TO PRESERVE THE WORLD'S GENETIC RESOURCES.

- Active participation at the national and international levels is involved;
  - . it must be recognized, however, that while survey, collection, and dissemination of these genetic resources is best carried out on a regional or international basis, their actual evaluation and utilization are matters for specific institutions and individual workers
    - .. international participation in the latter should concern exchange of techniques and findings.
- An international network is required with appropriate machinery to facilitate the interchange of information and genetic material among countries.
- Both static (seed banks, culture collections, etc.) and dynamic (conservation of populations in evolving natural environments) ways are needed.
- Action is necessary in six inter-related areas;
  - . survey of genetic resources
  - . inventory of collections
  - . exploration and collecting

  - documentation
  - evaluation and utilization
  - conservation
    - .. conservation represents the crucial element to which all other programmes relate.

- Although the international programme relates to all types of genetic resources, the action required for each resource will vary according to existing needs and activities.

108. MAKE INVENTORIES OF GENETIC RESOURCES MOST ENDANGERED BY DEPLETION OR EXTINCTION.

- All species threatened by man's development should be included in such inventories.

- Special attention should be given to locating in this field those areas of natural genetic diversity which are disappearing.

- These inventories should be periodically reviewed and updated by appropriate monitoring.

- The survey conducted by FAO in collaboration with IBP is designed to provide information on endangered crop genetic resources by 1972, but will require extension and follow-up.

109. COMPILE OR EXTEND, AS NECESSARY, REGISTERS OF EXISTING COLLECTIONS.

- Such a register should identify which breeding and experiment stations, research institutions and universities maintain which collections.

- Major gaps in existing collections should be identified where material is in danger of being lost.

- These inventories of collections should be transformed for computer handling and made available to all potential users.

- In respect to plants:

  - it would be expected that the "advanced varieties" would be well represented, but that primitive materials would be found to be scarce and require subsequent action

  - the action already initiated by FAO, several national institutions, and international foundations should be supported and expanded.

- In respect to micro-organisms, it is recommended that each nation develop comprehensive inventories of culture collections:

  - a cataloguing of the large and small collections and the value of their holdings is required, rather than a listing of individual strains

  - many very small but unique collections, sometimes the works of a single specialist, are lost

  - governments should assure that valuable gene pools held by individuals or small institutes are also held in national or regional collections.

- In regard to animal germ plasm, it is recommended that FAO establish a continuing mechanism to assess and maintain catalogues of the characteristics of domestic animal breeds, types and varieties in all nations of the world. Likewise, FAO should establish such lists where required.

- In regard to aquatic organisms, it is recommended that FAO compile a catalogue of genetic resources of cultivated species and promote intensive studies on the methods of preservation and storage of genetic material.

110. INITIATE IMMEDIATELY, IN CO-OPERATION WITH ALL INTERESTED PARTIES, PROGRAMMES OF EXPLORATION AND COLLECTION WHEREVER ENDANGERED SPECIES HAVE BEEN IDENTIFIED WHICH ARE NOT INCLUDED IN EXISTING COLLECTIONS.

- An emergency programme with the co-operation of the MAB programme, of plant exploration and collection should be launched on the basis of the FAO List of Emergency Situations for a 5-year period.

- With regard to forestry species, in addition to the efforts of the Danish/FAO Forest Tree Seed Center, IUFRO, and the FAO Panel of Experts on Forest Gene Resources, support is needed for missions planned for Latin America, West Africa, The East Indies and India.

111. CONSERVATION IS A MOST CRUCIAL PART OF ANY PROGRAMME OF GENETIC RESOURCES PROGRAMME. MOREOVER, MAJOR TYPES OF GENETIC RESOURCES MUST BE TREATED SEPARATELY BECAUSE:

- They are each subject to different programmes and priorities.

- They serve different uses and purposes.

- They require different expertise techniques and facilities.

112. PLANT GERM PLASM - AGRICULTURE AND FORESTRY: ORGANIZE AND EQUIP NATIONAL OR REGIONAL GENETIC RESOURCES CONSERVATION CENTRES.

   - Such centres as The National Seed Storage Laboratory in the United States and the Vavilov Institute of Plant Industry in the USSR already provide good examples.
   - Working collections should be established separately from the basic collections;
      - these will usually be located at plant breeding stations and will be widely distributed.
   - Three classes of genetic crop resources must be conserved;
      - high-producing varieties in current use and those they have superseded
      - primitive varieties of traditional pre-scientific agriculture (recognized as genetic treasuries for plant improvement)
      - mutations induced by radition or chemical means.
   - Species contributing to environmental improvement, such as sedge used to stabilize sand-dunes, should be conserved.
   - Wild or weed relatives of crop species and those wild species of actual or potential use in rangelands, industry, new crops, etc., should be included.

113. MAINTAIN GENE POOLS OF WILD PLANT SPECIES WITHIN THEIR NATURAL COMMUNITIES.

   - It is therefore essential that primeval forests, bushlands, and grasslands which contain important forest genetic resources be identified and protected by appropriate technical and legal means;
      - systems of reserves exist in most countries, but a strengthening of international understanding on methods of protection and on availability of material may be desirable.
   - Species of medical, aesthetic, or research value should be insured.
   - The network of biological reserves proposed by UNESCO (MAB) should be designed, where feasible, to protect these natural communities.
   - Where protection in nature becomes uncertain or impossible, then means such as seed storage or living collections in provenance trials or botanic gardens must be adopted.

114. FULLY IMPLEMENT THE PROGRAMMES INITIATED BY THE FAO PANELS OF EXPERTS ON FOREST GENE RESOURCES IN 1968 AND ON PLANT EXPLORATION AND INTRODUCTION IN 1970.

115. ANIMAL GERM PLASM: CONSIDER THE DESIRABILITY AND FEASIBILITY OF INTERNATIONAL ACTION TO PRESERVE BREEDS OR VARIETIES OF ANIMALS.

- Because such an endeavour would constitute a major effort beyond the scope of any one nation, FAO would be the logical executor of such a project;
    - . close co-operation with governments would be necessary, however
    - . IUCN might logically be given responsibility for wildlife, in co-operation with FAO, MAB (UNESCO), and governments.
- Any such effort should also include research on how to preserve, store, and transport germ plasm.
- Specific methods for the maintenance of gene pools of aquatic species should be developed.
- The recommendations of the FAO Working Party Meeting on Genetic Selection and Conservation of Genetic Resources of Fish, held in 1971, should be implemented.

116. MICRO-ORGANISM GERM PLASM: CO-OPERATIVELY ESTABLISH AND PROPERLY FUND A FEW LARGE REGIONAL COLLECTIONS.

- Full use should be made of major collections now in existence;
    - . no new centres should be contemplated in the developed world until those existing achieve regional significance.
- Although 19 major centres exist in the developed world, none can be found in developing countries;
    - . to provide geographic distribution and access to the developing nations, regional centres should be established in Africa, Asia, and Latin America.

117. ESTABLISH CONSERVATION CENTRES OF INSECT GERM PLASM.

- The very difficult and long process of selecting or breeding insects conducive to biological control programmes can only begin in this manner.

118. EVALUATION AND UTILIZATION ARE CRITICAL COROLLARIES TO THE CONSERVATION OF GENETIC RESOURCES.

- In respect to crop breeding programmes, it is recommended that governments give special emphasis to

- the quality of varieties and breeds and the potential for increased yields
- the ecological conditions to which the species are adapted
- the resistance to diseases, pests and other adverse factors
- the need for a multiplicity of effort so as to increase the chances of success.

119. COLLABORATE TO ESTABLISH A GLOBAL NETWORK OF NATIONAL AND REGIONAL INSTITUTES BASED ON AGREEMENTS ON THE AVAILABILITY OF MATERIAL AND INFORMATION, ON METHODS, ON TECHNICAL STANDARDS, AND ON THE NEED FOR TECHNICAL AND FINANCIAL ASSISTANCE WHEREVER REQUIRED.

- Facilities should be designed to assure the use by
  - breeders, to develop varieties and breeds both giving higher yields and having higher resistance to local pests and diseases and other adverse factors
  - users, providing facilities and advice for the safest and most profitable utilization of varieties and breeds most adapted to local conditions.
- Such co-operation would apply to all genetic resource conservation centres and to all types mentioned above.
- Standardized storage and retrieval facilities for the exchange of information and genetic material should be developed;
  - information should be made generally available and its exchange facilitated through agreement on methods and technical standards
  - international standards and regulations for the shipment of materials should be agreed upon
  - basic collections and data banks should be replicated in at least two distinct sites, and should remain a national responsibility
  - standardized and computerized system of documentation is required.
- Technical and financial assistance should be provided where required;
  - areas of genetic diversity are most frequently located in those countries most poorly equipped to institute the necessary programmes.

120. THE NEED FOR LIAISON AMONG THE PARTIES PARTICIPATING IN THE GLOBAL SYSTEM OF GENETIC RESOURCES CONSERVATION REQUIRES CERTAIN INSTITUTIONAL INNOVATIONS.

- It is recommended that the appropriate United Nations agency establish an international liaison unit for plant genetic resources in order to
  - . improve liaison between governmental and non-governmental efforts
  - . assist in the liaison and co-operation between national and regional centres with special emphasis on
    - .. international agreements on methodology and standards of conservation of genetic material
    - .. standardization and co-ordination of computerized record systems.
    - .. exchange of information and material between these centres.
  - . assist in implementing training course in exploration, conservation and breeding methods and techniques
  - . act as a central repository for copies of computerized information on gene pools (discs and tapes)
  - . provide the secretariat for periodic meetings of international panels and seminars on the subject
    - .. a conference on Germ Plasm Conservation might be convened to follow-up the successful conference of 1967
  - . plan and co-ordinate the five-year emergency programme on the conservation of endangered species
  - . further assist governments, wherever required, to implement their national programmes
  - . promote the evaluation and utilization of genetic resources at national and international levels.
- It is recommended that the appropriate United Nations agency initiate the required programme on micro-organism germ plasm;
  - . periodic international conferences involving those concerned with the maintenance and research on gene pools of micro-organisms should be supported
  - . such a programme might interact with the proposed regional culture centres by

        - .. assuring that each centre place high priority on the training of scientists and technicians from the developing nations
        - .. acting as a necessary liaison
        - .. lending financial assistance to those countries established outside the developed countries
    - . the international exchange of pure collections of micro-organisms between the major collections of the world has operated for many years and requires little re-enforcement
    - . study should be particularly conducted on waste disposal and recycling, controlling diseases and pests, and food technology and nutrition.

- *It is recommended that* FAO institute a programme in respect to animal germ plasm to assess and maintain catalogues of the economic characteristics of domestic animal breeds and types and of wild species and to establish gene pools of potentially useful types.

- *It is recommended that* the MAB project on the conservation of natural areas and the genetic material contained should be adequately supported.

## E. Fisheries

### (i) Considerations for action

121. CURRENT (1970) WORLD CATCHES OF MARINE FISH AND OTHER ORGANISMS AMOUNT TO SOME 57 MILLION TONS.

- The potential catches, considering only the types presently harvested, have been estimated by FAO at rather more than 100 million tons.
- The harvest of proteins from the total hydrosphere has increased at an annual average of about six per cent over the past 25 years.

122. HOWEVER, IN SOME AREAS AND FOR SOME IMPORTANT STOCKS, SUBSTANTIAL DECREASES IN THE YIELDS OF AQUATIC RESOURCES IN TERMS OF BOTH QUANTITY AND QUALITY HAVE BEEN OBSERVED.

123. ALTHOUGH IT IS OFTEN DIFFICULT TO DISTINGUISH AMONG FACTORS AND EFFECTS INVOLVED, THE MAIN CAUSES OF THIS SITUATION ARE:

- Natural fluctuations or changes in environmental conditions.
- Over-fishing with large fleets, new techniques, improved technology and increased means.
- Pollution of the aquatic environments, in particular coastal and inland waters, by disposal of industrial and domestic wastes and other pollutants.
- Other man-made modifications of aquatic ecosystems such as:
    - . consumption of water by irrigation and other uses
    - . changes in the flow of rivers and their sedimentation
    - . land reclamation and other works in coastal areas
    - . dredging and drilling operations for minerals and oil in offshore and inshore waters.

124. AN INCREASING NUMBER OF AQUATIC POPULATIONS SHOW THE CUMULATIVE EFFECT OF THESE VARIOUS STRESSES TO LEVELS BEYOND THEIR CAPABILITY OF ACCOMMODATION, e.g.:

- Some whale species, Californian sardines, North Atlantic herrings and several others which have been greatly depleted under heavy exploitation.
- Fish stocks in inland waters such as the Great Lakes in North America and in several rivers such as the Rhine.
- Oyster cultures etc. in coastal waters which were depleted or disappeared due to pollution or other man-made changes.

125. AQUACULTURE AND, IN SOME CASES, INTRODUCTION OF EXOTIC FISH SPECIES ARE INCREASINGLY USED TO SOLVE SOME OF THESE PROBLEMS.

- However, aquaculture is particularly vulnerable to various forms of pollution and contamination, although, in some cases, domestic wastes and thermal pollution could be beneficially utilized.

- Introduced fish species have, in some instances, seriously reduced the economic value of existing fisheries, notably in fresh waters, e.g. lamprey and alewife;

  - national regulations have not been fully effective in guarding international waters against such occurrences.

(ii) Recommendations for national action

It is recommended that governments give consideration to the following proposals:

126. RESEARCH SHOULD BE STRENGTHENED RELATING TO:

- The functioning of aquatic ecosystems and their productivity.

- Transplantation of non-native species to new habitats and their acclimatisation; conducting of suitable tests on controlled conditions to achieve this.

- The basic physical, chemical, and biological processes of dilution, dispersal and decomposition of wastes and concentration of pollutants in the aquatic environment, especially in inshore waters.

- The effects of pollutants on aquatic resources and ecosystems including the sub-lethel effects (see Subject Area III paper).

- The effects of major man-made modifications of the river flows and of water movements in coastal areas.

- The treatment of waste waters to prevent the discharge of toxic and other undesirable substances in the aquatic environment.

- The use of aquaculture especially to recycle and conserve the resources present in domestic wastes particularly where there is a concurrent protein shortage, developing safeguards against the transmission of pathogens and pollutants to man.

127. SURVEYS AND MONITORING ACTIVITIES SHOULD BE DEVELOPED.

- Collection of data on catch state of resources and fisheries activities should be improved in order to provide a more reliable and accurate basis for the assessment of fish stocks, their management and fishery development activities.

- This information should be closely associated with data on the environment including that provided by the monitoring of pollutants in the aquatic environment. (See Subject Area III paper)

128. OVERALL DEVELOPMENT POLICIES AND PLANS SHOULD TAKE DUE ACCOUNT OF THE INCREASING ROLE OF FISHERIES IN WORLD FOOD SUPPLY AND OF THEIR VULNERABILITY TO MULTIPLE FORMS OF DAMAGE BY OTHER DEVELOPMENT ACTIVITIES, PARTICULARLY THOSE AFFECTING PRODUCTIVE COASTAL AREAS.

- Ecologically and economically valid interest of fisheries should be protected accordingly.

129. IN ORDER TO FURTHER ENLARGE THE PROTEIN HARVEST FROM THE HYDROSPHERE THE PRODUCTIVITY OF THE AQUATIC RESOURCES SHOULD BE PROTECTED AND ENHANCED BY:

- Rational management of fish stocks through implementing appropriate regulatory controls based upon monitoring and periodic assessments of fish stocks and catches.

- Diversifying fisheries within the large resources of the hydrosphere.

- Developing aquaculture.

- Controlling the discharge of toxic wastes.

- Using and recycling some of the non-toxic wastes for aquaculture.

- Preventing and/or reducing the harmful consequences of man-made modifications of fresh water bodies and coastal areas.

- Exerting a careful control on the conditions governing the transfer and introduction of exotic fish species.

130. THE FOLLOWING ACTION REQUIREMENTS SHOULD BE CONSIDERED:

- The required research institutions and related training facilities should be established or strengthened to implement action proposals presented in para.7 above, and to allow effective participation in the activities of the regional and international fisheries bodies.

- Fisheries institutions should be adequately supported to undertake required environmental and biological research and to provide necessary data on catches state of resources and fisheries activities and make periodic assessment of fish stocks. These institutions should closely collaborate with those in charge of monitoring water pollution.

- The exchange of information relating to aquaculture introducing of exotic species, as well as the exchange of expertise in these fields should be fostered.

- Fisheries legislation and regulatory control institutions will need to be reviewed and their effectiveness improved to cope with increasing demand for protecting fisheries. The training of specialists for these fields will be necessary, as will the provision of adequate resources and facilities.

### (iii) Recommendations for international action

It is recommended that governments, and the Secretary-General in co-operation with FAO and other UN organizations concerned, as well as development assistance agencies take steps to:

131. SUPPORT RECENT GUIDELINES, RECOMMENDATIONS, AND PROGRAMMES OF THE VARIOUS INTERNATIONAL FISHING ORGANIZATIONS.

- A large part of the needed international action has been identified with action programmes initiated by FAO and its Intergovernmental Committee on Fisheries and approximately 24 other bilateral and multilateral international commissions, councils and committees. In particular these organizations are planning and undertaking:

  . co-operative programmes such as that of LEPOR (Long-Term and Expanded Programme on Oceanic Research), GIPME (Global Investigation of Pollution in the Marine Environment) and IBP (International Biological Programme)
  . exchange of data, supplementing and expanding the services maintained by FAO and bodies within its framework in compiling, disseminating and co-ordinating information on living aquatic resources and their environment and fisheries activities
  . evaluation and monitoring of world fishery resources, environmental conditions, stock assessment, including statistics on catch and effort, and the economics of fisheries
  . assistance to governments in interpreting the implications of such assessments, identifying alternative management measures, and formulating required actions
  . special programmes and recommendations for management of stocks of fish and other aquatic animals proposed by the existing international fishery bodies;

    .. damage to fish stocks has often occurred because regulatory action is taken too slowly
    .. historically the need for management action to be nearly unanimous has reduced action to the minimum acceptable level.

132. ENSURE CLOSE PARTICIPATION OF FISHERY AGENCIES AND INTERESTS IN THE PREPARATIONS FOR THE UN CONFERENCE ON THE LAW OF THE SEA.

- In order to safeguard the marine environment and its resources through the development of effective and workable principles and laws, the information and insight of international and regional fishery bodies, as well as the national fishery agencies are essential.

133. ENSURE INTERNATIONAL CO-OPERATION IN THE RESEARCH, CONTROL AND REGULATION OF THE SIDE EFFECTS OF NATIONAL ACTIVITIES IN RESOURCE UTILIZATION WHERE THESE AFFECT THE RESOURCES OF OTHER NATIONS.

- Estuaries, inter-tidal marshes, and other near-shore and inshore environments play a crucial role in the maintenance of several marine fish stocks. Similar problems exist in those fresh-water fisheries that occur in shared waters.

- Discharge of toxic chemicals, heavy metals, and other wastes may effect even high seas resources.

- Certain exotic species, notably the carp, lamprey, alewife, have invaded international waters with deleterious effects as a result of unregulated unilateral action.

134. FURTHER DEVELOP AND STRENGTHEN FACILITIES FOR COLLECTING, ANALYZING AND DISSEMINATING DATA ON LIVING AQUATIC RESOURCES AND THE ENVIRONMENT IN WHICH THEY LIVE.

- Data already exist concerning the total harvest from the oceans and of certain regions in respect of individual fish stocks, their quantity, the fishing efforts expended on them, and of their population structure, distribution and changes. This coverage needs to be improved and extended.

- It is clear that a much greater range of biological parameters must be monitored and analyzed in order to provide an adequate basis for evaluating the interaction of stocks and managing the combined resources of many stocks. There is no institutional constraint on this expansion but a substantial increase in funding is needed by FAO and other international organizations concerned to meet the needs of this expanding need for data.

- Full utilization of present and expanded data facilities is dependent on co-operation of governments in developing local and regional data networks, making existing data available to FAO and to the international bodies and formalizing the links between national and international agencies responsible for monitoring and evaluating fishery resources.

135. ENSURE FULL CO-OPERATION AMONG GOVERNMENTS BY STRENGTHENING THE EXISTING INTERNATIONAL AND REGIONAL MACHINERY FOR DEVELOPMENT AND MANAGEMENT OF FISHERIES AND THEIR RELATED ENVIRONMENTAL ASPECTS, AND IN THOSE REGIONS WHERE THESE DO NOT EXIST, ENCOURAGE THE ESTABLISHING OF FISHERY COUNCILS AND COMMISSIONS AS APPROPRIATED.

- The operational efficiency of these bodies will largely depend on the ability of the participating countries to carry out their share of the activities and programmes.

-

- Technical support and servicing from the specialized agencies, in particular from FAO, is also required.

- The assistance of bilateral and international funding agencies will be needed to ensure the full participation of the developing countries in these activities.

## F. Water

### (i) Considerations for action

136. WATER, AN ESSENTIAL COMPONENT OF MAN'S ENVIRONMENT, IS:

- . the primary constituent of all living things
- . the most abundant compound on the earth's surface
- . the universal solvent
- . a factor of weather and climate
- . a primary means of transportation
- . a critical element of man's development activities
- . the ultimate repository for many natural and man-made wastes.

137. ALTHOUGH A TOTALLY RENEWABLE RESOURCE, THE SUPPLY OF FRESH WATER IS LIMITED BY QUANTITY AND DISTRIBUTION.

- While 70 per cent of the earth's surface is covered by water, only 2 per cent of the total supply is fresh water;
  - . most of this is stored as groundwater, ice caps, or glaciers and except for groundwater is inaccessible to man
  - . only .002 per cent of the total amount is directly available for human activities
    - .. this represents slightly less than the total annual runoff from all lands of the world of 30,000 km3.
- The natural distribution of fresh water is highly variable from region to region and season to season.
- Of the manageable fresh water supply, groundwater represents 96 per cent, lakes 2 per cent, and stream channels less than 1 per cent.

138. MAN'S ACTIVITIES IMPOSE MANY DEMANDS UPON THIS LIMITED WATER SUPPLY. THE QUANTITY OF WATER REQUIRED BY MAN FOR HIS DIRECT USE IS CONSIDERABLE AND IS INCREASING;

- It is estimated that water use will increase from 2000 $km^3$ in 1967 to 5450 $km^3$ in the year 2000;
  - . the demands for water are already surpassing the available resources of many countries especially in the arid and semi-arid regions.

- Agriculture currently uses about 70 per cent of all water consumed in order to irrigate approximately 200 million hectares of land.
- The requirements of industry - for supply, waste disposal, and cooling - impose a severe strain on water resources;
  - a shift in the percentage of water use from agriculture to industry and power is expected as countries develop.
- Domestic and conventional needs for water are also increasing.
- The disposal of every conceivable variety of waste from human activities, ranging from domestic sewage to the acids and oils of industrial wastes, is a principal and historic use of water.

139. INEXTRICABLY LINKED TO THE VOLUME OF WATER MAN USES IS THE QUALITY OF THE WATER AS AFFECTED BY HIS ACTIVITIES.

- Direct use represents only a portion of man's activities adversely affecting the quality of water;
  - deterioration frequently proceeds from direct use. For example:
    - power plants, particularly nuclear, impose a heat load on the aquatic environment
    - the water runoff following irrigation may contain biocides and chemical fertilizers
    - interbasin transfers of water may increase the supply where needed, but such projects also may have an irreversible effect on the environment as regional water balances are changed. Such imbalances may seriously affect aquatic biota, climate and the mineral content of the water
    - industrial effluents and municipal sewage are frequently dumped directly into receiving waters
  - however, water quality also suffers considerably from independent human activities
    - uncontrolled deforestation induces erosion and subsequent sedimentation
    - automobile exhaust can contribute to water contamination.

- Water pollutants can be classified into several major categories:

  - . infectious agents - microbial or viral agents that can transmit disease to people
  - . oxygen-demanding wastes - wastes added to water that increase the gross respiration rate of aquatic or marine micro-organisms to the extent that the concentration of dissolved oxygen in the water is decreased
  - . plant nutrients - compounds of carbon, nitrogen, and phosphorous, such as fertilizers or detergents, that promote undesirable plant growth (primarily algae) in water
  - . organic chemicals - waste products from organic chemical manufacturing operations or pesticides that may be toxic to the flora and fauna in the water, or that may impart disagreeable taste and odours to the water
  - . inorganic chemical - dissolved inorganic materials such as chloride that may decrease the value of water for subsequent usage, or heavy metals such as mercury or lead that may be toxic to animal life
  - . sediments and other solids - soils and other material eroded from watersheds that may fill reservoirs, irrigation ditches, and navigation canals
  - . radioactivie materials - radionuclides released from nuclear reactors or other sources, and
  - . heat - the utilization of a body of water as a heat sink, generally for an industrial process or a thermal-electric generating plant, that might result in excessive plant growth.

- It should be recognized, however, that only when concentrations are sufficiently high will water quality be impaired.

140. NATURAL POLLUTION OF THE WATER RESOURCE ALSO CONTINUES AT A RELATIVELY CONSTANT RATE.

  - It takes the form of dissolution of rock minerals, natural transport of sediments, washing of the atmosphere, encroachment of mineralized waters and thermal stratification.

141. THIS CUMULATIVE AND INCREASING BURDEN UPON BOTH THE QUALITY AND QUANTITY OF THE RESOURCE THREATENS THE FUTURE SUPPLY OF USEFUL WATER.

- The aquatic ecosystem is more closed and vulnerable than its terrestrial counterparts.
- The demands imposed upon it will continue to increase dramatically.
- A high percentage of the world's population already has insufficient access to safe water.

142. THE ENVIRONMENTAL DETERIORATION OF OTHER RESOURCES RESULTING FROM THE MISUSE OF WATER ALSO MERITS ATTENTION.

- Waterlogging, salinization, and land subsidence represent some of the most striking examples;
  - . improper drainage for the soil of arid regions sometimes results in salinization and alkalization
  - . overpumping of groundwater resources may lead to salt water intrusion and to subsidence of land surfaces.
- Other examples include overflow, flooding, and erosion.
- Environmental repercussions arising from water impoundments also require serious attention;
  - . in one or another projects water-borne diseases have been spawned; sedimentation from surrounding erosion has filled reservoirs; aquatic weeds have spread uncontrollably; down-stream fisheries have dried up; without the silt of the spring floods, delta land has been disappearing and losing its fertility; resettling of the displaced population has often proved difficult and social costs have been high; microclimates have been altered.

143. WATER, TO BE OF USE IN ANY GIVEN ACTIVITY, MUST BE MADE AVAILABLE IN THE REQUIRED AMOUNT, AT THE REQUIRED TIME AND PLACE, AND IN THE REQUIRED QUALITY FOR THE SPECIFIC APPLICATION INTENDED.

- In pursuit of this objective, attention must be paid to avoid environmental repercussions adverse to other resources and social objectives.
- To meet this goal, the pressures on quality and quantity should be anticipated and countered by preventive measures.

144. INTEGRATED PLANNING AND MANAGEMENT OF WATER DEVELOPMENT AND CONSERVATION IS NEEDED.

- The complementary and competitive relationships among various uses and objectives - water quality improvement, energy generation, navigation, flood, irrigation, water supply, and water-based recreation control - should be reconciled and co-operatively planned and managed by inter-disciplinary teams:
    - once all demands are identified, analyses should be made to determine what programmes should be undertaken and how they should be financed
        - the appropriate pricing structures and mechanisms for regulating water supply and demand under each alternative should be assessed
    - all feasible system plans and procedures should be considered
        - the full possibilities of management of both water quantity and quality should be explored
        - the most efficient use of water by agriculture, industry and municipalities should be determined
        - opportunities for re-use should be fully developed
    - a solution would hopefully be derived which would indicate the optimum combination of elements and operating procedures in light of the relevant objectives and constraints
        - the complexity of the problem, the absence of required data, and the unpredictability of natural phenomena frequently preclude optimum solutions, however
        - in any case, this approach should provide major economies over conventional treatment.
- The unified approach can be best implemented through large-scale comprehensive regional or river-basin resources development programmes.
- The necessary legal and administrative framework should be provided to permit national inter-agency co-operation and implementation of water resource policies through the adoption and enforcement of standards, and the use of incentives. Negative incentives in the form of taxes against undesirable practices, or positive incentives that may provide cost sharing for desirable actions can be used.
- The compatibility of surrounding land use practices should be assured.

- The extent to which legal, policy and managerial factors are considered should be expected to vary according to:

  . particular cultural and social values

  . the stage of a region's or country's development

  . environmental standards to be adopted.

- However, the absence of a unified approach will result in a sub-optimal solution, characterized by conflicting objectives and adverse environmental repercussions.

- The Ruhr area of West Germany, the English River Authorities and the River Plate Intergovernmental Commission represent a few examples of successful integrated management.

145. AN INTEGRATED APPROACH TO WATER QUALITY IS A PRINCIPAL COMPONENT OF ANY COMPREHENSIVE PLAN.

- Standards for water quality must first be selected on the basis of

  . the results of an initial water resource survey

  . the scientific assessment of the current water quality

  . the best available estimate of the pollutant assimilative capacity of the water resource

    .. measurements to be considered include the oxygen content of the water, the nature and quantity of suspended solids, the existence and speed of currents and thermal stratification the nature of the water body, etc.

  . the intended use of the water resource.

- Moreover, the continuous monitoring of water resources should be encouraged.

- All parameters will vary from one set of circumstances to the next and will change over time, so that constant review is required.

- Standard setting will sometimes be particularly difficult within federal states; and agreement on objectives might be the only alternative.

- The degree to which the effects of poor water quality are discernable will vary;
  - the effects on municipal and industrial uses can be measured directly in terms of costs
  - agriculture is complicated because of the complex interactions between water quality and crop yield
  - still more complicated is determination of the effects on aquatic life, water-based recreation, and aesthetics.
- All methods of improving the quality of receiving waters should be explored. These include:
  - methods for diminishing waste discharge through reducing:
    - .. wastes generation
    - .. wastes after generation
  - methods for increasing or making better use of assimilative capacity.
- The best method for treating industrial or municipal wastes should be selected from many alternatives.
- Alternatives to waste treatment should also be examined;
  - alternative modes for disposal of concentrated wastes include: land burial, incineration, deep well disposal and placement in cavities formed below circulating water
    - .. these must be undertaken with great caution, however
  - other alternatives include streamflow regulation, in-stream water quality improvement measures, the diversion of waste waters from sensitive areas, the use of waste waters for irrigation, or a revision of the incentive system bearing on the generation and disposal of waste waters
    - .. the productive use of heat released into receiving waters should be further developed.

146. THE PROPER USE OF WATER FOR AGRICULTURAL PURPOSES NEEDS TO BE ASSESSED, WHERE NECESSARY, AND CAREFULLY REGULATED.

- Knowledge of water-soil-plant relations, and proper farm irrigation system design and operation, should be applied in order that maximum crop returns may be realized with minimum adverse effects on the water and soil resources.

- The proper combination of water, fertilizer and pesticide should be applied in order that there is a minimum excess to degrade surplus waters.

147. A VARIETY OF METHODS EXIST FOR MANAGING THE SUPPLY AND DISTRIBUTION OF WATER.

- Methods such as dams, canals, and groundwater pumping and recharge are relatively well known;

  . their environmental repercussion should now be closely examined.

- Several newer methods exist on which development work should be continued:

  . weather modification

  . desalination.

    .. although desalination is technically feasible, it is costly

  . lining distribution networks in agriculture and improved drainage of irrigated fields

  . water re-use.

    .. water must not only be available, but also of a suitable quality for specific functions, be it processing, boiler feed water, cooling, or sanitary purposes

  . multiple-use reservoirs

  . technological modification to require less water in the industrial process.

148. THE ECONOMIC ASPECTS OF INTEGRATED PLANNING AND MANAGEMENT ARE CRUCIAL.

- Conflicting uses could be evaluated within expanded cost-benefit analysis.

- Supply and demand should be reflected in the appropriate price structure.

149. LEGISLATIVE INNOVATIONS MAY BE REQUIRED TO ENSURE THE INTEGRATED MANAGEMENT OF WATER RESOURCES.

- Although the technical means for a unified approach are largely available, realization is frequently impeded by the ad hoc nature of past and present water projects;

  . projects are too frequently governed by separate legal enactments and administered by different governmental departments.

- Legislation should balance the sociological, religious and philosophical character of the people with ecological and economic considerations;

  . community participation should be strongly supported in the planning of all water projects.

- A basic code or act might well include the following provisions:

  . the ownership of water should be defined with respect to both surface and ground water

    .. if public ownership is not feasible, the right of state to regulate or control ownerships should be considered essential

  . the right to the use of water should be distinct from ownership

  . water conservation should include considerations of public health, land conservation, improvement of supplies, drainage, waterlogging and salinization, pollution abatement and environmental protection

  . a water rights administration or water planning board should allocate water as to amount, purpose and time, and these should be centrally administered, within each region, river or basin

  . co-ordination should be assured with other enactments related to water such as forestry, fisheries, housing, land use and settlement, mining, land reform, and municipal and town planning

  . implementation and enforcement should include judicial and administrative protection of water rights and claims

  . existing water legislation inconsistent with the basic or consolidated water act or code should be repealed

  . water institutions and administration needed to bring water under centralized administrative management should be established.

150. A NUMBER OF FACTORS PREVENT TAKING FULL ADVANTAGE OF KNOWN TECHNOLOGY.

- As problems become more complex there are numerous inter-relationships that must be taken into account, all of which are not well understood.

- Some of the newly developed control and management techniques are too costly for some countries to adopt.

- In developing countries the technologies that have been tried and proven in industrialized countries may require some modification in order that water resources be managed relatively cheaply;

  - this will mean the training of technicians and engineers from developing countries in skills required to design and construct machinery suitable for local use.

- There is inadequate communication between those who construct a water project and those who use it, i.e., the engineers and the agriculturists.

(ii) Recommendations for national action

It is recommended that national governments give consideration to the following proposals:

151. GOVERNMENTS SHOULD ESTABLISH, WHERE THIS HAS NOT YET BEEN DONE, AN INTEGRATED INSTITUTIONAL FRAMEWORK FOR WATER RESOURCES MANAGEMENT AND DEVELOPMENT.

- The institutional framework should include appropriate institutions (agencies, authorities, institutes, boards, councils, etc.) of nationwide as well as of regional and local competence;
  - in the subdivision of the responsibilities, among areas, due attention should be paid to the boundaries of the national hydrological regions (river basins, lake basins, groundwater systems)
  - the institutional framework should not be subordinated to any of the agricultural or industrial departments representing only one or a group of the water management fields.
- The institutional framework should be structured and staffed for the execution or supervision and co-ordination of the following principal functions:
  - legal and fiscal administration in all the fields of water management relevant under the conditions of the country.
    This includes:
    - providing affected parties the opportunity to have a voice in decisions
    - granting rights and issuing licenses, permits, or concessions
    - provision that externalities associated with waste discharge be accounted for
  - operation of water supply and water management systems
  - water resources development planning
  - construction and maintenance of water management projects and structures
  - data acquisition and research.

- Allocation of water as to amount, quality and timing should be centralized at the national and regional levels in planning as well as in operational decisions.

- Structures and procedures should be established assuring an equitable co-operation with other branches of the national administration at appropriate levels.

152. GOVERNMENTS SHOULD UNDERTAKE, WHERE NECESSARY, COMPREHENSIVE SURVEYS OF WATER RESOURCES AND WATER DEMANDS.

- The surveys should include:

  . the assessment of the actually and potentially available fresh water resources with due attention to

    .. the availability of hydrological, meteorological and hydrogeographical data and inventories

    .. the interdependences among the water resources of the adjacent regions as well as among the different types of the water resources (rivers, lakes, groundwaters)

    .. the opportunities of augmenting the available resources by storage reservoirs, artificial recharge of groundwaters, watershed management and other measures

    .. the quality and time distribution of the available resources

  . the assessment of the actual water uses and expected future water requirements whereby

    .. particular attention should be paid to domestic and public water supply

    .. elasticity of the industrial and agricultural water requirements should be considered

    .. quality requirements and polluting effects should be identified.

  . an integrated evaluation of the resources and demands with due attention to

    .. the opportunities of balancing the discrepancies in the distribution of their time and area

    .. the possibilities of multiple use of water

    .. flood control

    .. pollution control and other environmental effects.

- Major changes in the water uses should be registered on an annual basis and the comprehensive surveys should be renewed periodically in order to detect inevitable changes in water distribution and quality.

- The results of the surveys should be evaluated also in the broader contexts of co-operation with neighbouring countries.

153. GOVERNMENTS SHOULD FORMULATE AND ADOPT INTEGRATED WATER RESOURCES POLICIES.

- The national water resources policy should be based on the results of the surveys of water resources and demands and it should identify

  - the basic principles and fundamental procedures under which water is managed and developed

  - the basic approaches in assuring the proper place and role of water management in the general national and regional planning and development

  - the interests and potential roles of the country in the broader context of the bilateral, multilateral and international issues of water resources development.

- All funding should be done on the basis of comprehensive national or regional plans, and individual projects supported only within the framework of such plans;

  - treatment facilities can thereby be combined and economies of scale achieved

  - priorities can be assigned by identifying areas of greatest need.

- Price mechanisms including effluent charges and other economic measures should be used where appropriate to stimulate more efficient use of water.

- The necessary legal and legislative adjustments to conform to such a policy should be effected.

- All social and cultural factors, including public participation, should be provided for.

- A multidiciplinary team should be assembled to undertake the necessary planning and management.

154. GOVERNMENTS SHOULD GIVE SPECIAL ATTENTION TO POLLUTION CONTROL AND OTHER ENVIRONMENTAL ASPECTS OF WATER RESOURCES MANAGEMENT.

- Pollutants of special concern are toxic industrial wastes, chemicals including heavy metals, and bacterial contaminants and viruses.

- Various independent activities, such as uncontrolled deforestation or land reclamation should also be viewed with a concern for water quality.

- Local, regional and national water quality monitoring systems should be established, where appropriate, to prevent damages from unexpected pollution.

- Systems of national environmental impact statements should be developed and introduced as organic parts of the national water resources planning regulations.

155. GOVERNMENTS SHOULD ENCOURAGE THE INCREASED EFFICIENCY OF WATER USE IN AGRICULTURE AND IN INDUSTRY.

- Existing networks of irrigation, drainage, and water management practices, at the farm level, should be improved to

  - increase yields of crop and grazing lands

  - avoid losses of water, soil and plant nutrients by runoff and percolation, thus reducing the hazards of water pollution and of soil degradation by erosion, salinization and water-logging.

- Increased efficiency should be achieved in order to

  - save water enabling further extension of the existing water supply systems

  - reduce the spread of water-borne diseases.

- Water saving programmes could be introduced and stimulated by

  - promoting closer co-operation between the water supplying and water using agencies and undertakings

  - the application of price-systems reflecting real costs of water supply and pollution control.

156. GOVERNMENTS SHOULD ENGAGE IN THE ACQUISITION OF NEW KNOWLEDGE AND CO-OPERATE IN THE TRANSFER OF EXISTING KNOWLEDGE, AS PRIORITIES INDICATE.

- Technology exists to treat water to prevent the transmission of bacterial diseases, although more knowledge is needed about the removal of more complex contaminants and, in particular, viral organisms.

- Technology exists for the removal of specific contaminants from point sources, for economically treating municipal wastes for the efficient removal of suspended and dissolved solids and for preventing increases in biochemical oxygen demand loadings;

  . however, the operation of systems for handling residues from a number of dispersed sources and their common treatment is not too well understood due to the complex and unrelated varieties of the disposal sources.

- Technology exists to provide tertiary treatment of wastes to remove nutrients and dissolved solids, among other things, but in many cases this degree of treatment is not economically acceptable depending on the quality reached in the treatment process and that demanded by the consumers.

- Systems analysis techniques are well developed but their application to water resource management problems has been limited because of the lack of knowledge about the varieties components of the system as they apply to water problems. These are

  . identification of new parameters for evaluating the social and economic values that are essential for making the best choice among alternatives

  . development of various type institutional arrangements to facilitate water resource management on a national and international basis.

- Technology exists to recover waste products for recycling, but more efficient methods of removal and recovery are frequently needed to make such practices more economical. Moreover, technologies are needed which decrease the demand on water.

- Technology exists for the recharging of groundwater and for deep well disposal, but more knowledge is required on leaching effects and the behaviour of groundwater.

- Isotope techniques provide a new and often cheaper tool to study the interrelationships of lakes and groundwater, different acquifers, areas of recharge, and groundwater flow.

- Other major gaps in knowledge include:

  . prevention of water losses by runoff, evaporation and percolation effects of irrigation and drainage on the environmental, management and efficient use of soil water

  . use of water of poor quality and re-use of water by industry and in agriculture

- improved water recycling techniques for various industrial uses
- development and management of groundwater resources, particularly in relation to surface waters and including consideration of the selective transport of pollutants through underground aquifers
- improved management of water where if falls, including the development of improved techniques in rain-fed agriculture
- management of water for fisheries developments
- development of water quality indices, which could note trends and upon which policy decisions could be taken (as are economic decisions on the basis of GNP)
- long-range toxic effects of certain metals and of new synthetic organic substances that persist in the receiving water even after conventional treatment and that are stable to biological attack
- improvement in methods and procedures to identify and measure the presence of toxic metals, organic chemicals, and other contaminants in water
- the action, under various conditions, of oxidation ponds and other cheap methods of waste treatment, and the use of such procedures for the treatment of industrial wastes
- the institutional aspects of water quality control
- the management rather than the analytical techniques for planning
- the relationship between water quality control and bathers' health
- the environmental impacts of water development projects.

- Many other research needs can be readily identified but cannot be included here.
- Each nation should carefully identify its research priorities:
  - those countries with relatively undeveloped resources should focus on applied studies of the more practical kind, development orientated, and related to local resources and manpower skills
  - those countries with more advanced management capabilities should focus on more fundamental investigations requiring more sophisticated skills and physical as well as financial resources.

157. GOVERNMENTS SHOULD SUPPORT FORMAL AND SHORT-TERM TRAINING COURSES ESSENTIAL TO THE DEVELOPMENT OF EFFECTIVE WATER MANAGEMENT PROGRAMMES.

- Courses should be initiated that will permit the updating of current staff in techniques and methodologies being developed.

- Governments should encourage those seeking training in industrialized countries to concentrate their efforts, particularly any research studies, on problems relevant to their own countries' needs.

- Governments should support the creation within their academic institutions of interdisciplinary courses and degrees on unified water planning and management

  . the traditional sectors of sociology, engineering, economics, agronomy, ecology, etc. must be combined and fitted to the new needs of integration.

- The inadequate number of sewage treatment operators, familiar with the increasingly sophisticated facilities, must be remedied by training courses.

158. GOVERNMENTS SHOULD ENCOURAGE THE TRANSLATION OF LABORATORY INVESTIGATIONS TO FIELD PRACTICE.

- The exchange of personnel between operating and research agencies.

- The funding of investigations by operating agencies.

- Having operating agencies participate in decision-making on study programmes.

### (iii) Recommendations for international action

159. IT IS RECOMMENDED THAT GOVERNMENTS CONCERNED CONSIDER THE CREATION OF APPROPRIATE MULTINATIONAL INSTITUTIONS IN THE FORM OF INTERNATIONAL RIVER-BASIN COMMISSIONS, FOR WATER RESOURCES COMMON TO MORE THAN ONE JURISDICTION.

- Full consideration should be given to the sovereign rights of each country concerned to develop its own resources.

- The following principles should be upheld:

  . that nations agree that when water resource activities are contemplated that may have an environmental effect on another country, the other country be notified well in advance of the activity envisaged

  . that the basic objective of all water resource use and development activities is to provide maximum net benefits to the combination of all nations affected by such activities

  - that the net benefits of hydrologic regions common to more than one national jurisdiction are to be shared equitably by the nations affected.

- Such arrangements will permit undertaking on a regional basis:
  - collection, analysis, and exchange of hydrologic data through some agreed upon international mechanism
  - joint data-collection programmes to serve planning needs
  - assessment of environmental effects of existing water uses
  - joint study of the causes and symptoms of problems related to water resources, taking into account the technical, economic, and social considerations of water quality control
  - co-operative management, including a programme of quality control, of the water resource as an economic asset
  - provision for the judicial and administrative protection of water rights and claims
  - prevention and settlement of disputes with reference to equitable apportionment and conservation of water resources
  - financial and technical co-operation of a shared resource.
- Regional conferences should be organized to promote the above considerations.

160. IT IS RECOMMENDED THAT THE SECRETARY-GENERAL TAKE STEPS TO:

(a) ENSURE THAT APPROPRIATE UNITED NATIONS BODIES SUPPORT GOVERNMENT ACTION WHERE REQUIRED;

  - reference is made to FAO, WHO, WMO, ESA/RTD, and the regional economic commissions. For example
    - the first has established a Commission on Land and Water Use for the Middle East which promotes regional co-operation in research, training and information *inter-alia* on water management problems
    - the second has available the International Reference Centre for Waste Disposal located in DÜbendorf, Switzerland and the International Reference Centre of Community Water Supply in the Netherlands
    - the third has a Commission on Hydrology which provides guidance on data collection and establishment of hydrological networks

.. the fourth has established the United Nations Water Resources Development Centre

similar specialized centres should be established at regional level in developing countries for training, research and information exchange on

.. inland water pollution and waste disposal in co-operation with WHO, FAO and regional economic commissions of the United Nations

.. water management for rain-fed and irrigated agriculture, by FAO in co-operation with the regional economic commissions

.. integrated water resources planning and management in co-operation with ESA/RTD and the regional economic commissions.

(b) ENSURE THAT THE UNITED NATIONS SYSTEM IS PREPARED TO PROVIDE TECHNICAL AND FINANCIAL ASSISTANCE TO GOVERNMENTS WHEN REQUESTED IN THE DIFFERENT FUNCTIONS OF WATER RESOURCE MANAGEMENT.

- Surveys and inventories.
- Water resources administration and policies, including
  - establishment of institutional frameworks
  - economic structures of water resources management and development
  - water resources law and legislation.
- Planning and management techniques, including
  - assignment of water quality standards
  - implementation of appropriate technology
  - more efficient use and reuse of limited water supplies.
- Basic and applied studies and research.
- Transfer of existing knowledge.
- Continuing support of the programme of the International Hydrological Decade.

(c) ESTABLISH A ROSTER OF EXPERTS WHO WOULD BE AVAILABLE TO ASSIST GOVERNMENTS, UPON REQUEST, TO ANTICIPATE AND EVALUATE THE ENVIRONMENTAL EFFECTS OF MAJOR WATER DEVELOPMENT PROJECTS.

- Governments would have the opportunity of consulting teams of experts drawn from this roster, in the first stages of project planning;
  - guidelines could be prepared to assist in the review and choice of alternatives.

(d) PREPARE A COMPREHENSIVE ASSESSMENT AND EVALUATION OF THE ACTUAL AND POTENTIAL ENVIRONMENTAL EFFECTS OF WATER MANAGEMENT UPON THE OCEANS.

- The oceans are the ultimate recipient for the natural and man-made wastes discharged into the river systems of the continents.
- Changes in the amount of riverflow into the oceans, as well as in its distribution in space and time may considerably affect the physical, chemical and biological regime of the estuary regions and influence the oceanic water systems.

## G. Mining and primary mineral processing

### (i) Considerations for action

161. INDUSTRIAL CIVILIZATION WOULD BE IMPOSSIBLE WITHOUT MINERALS, YET MINERAL EXPLORATION, MINING, AND DRILLING ARE ALL ACTIVITIES THAT REQUIRE TEMPORARY OCCUPATION OF LAND AND THAT MAY DEGRADE THE ENVIRONMENT.

- Large amounts of land are disturbed, especially by surface mining, subsidence over underground mines, the proliferation of small quarries, and waste dumps.

- Plants and wildlife may be stunted or destroyed.

- Fires may be ignited.

- Fresh or salt water bodies may be contaminated.

- Dusts and fumes are emitted into the air;

  . part of the problem involves air quality, but it also affects the miner who, through chronic exposure to airborne dust or radiation, may be subjected to severe health hazards.

162. HOWEVER, IN THE PRIMARY PROCESSING STAGE - SMELTING, REDUCING, REFINING ETC. - THE DISTURBANCE OF LAND IS NOT A MAJOR PROBLEM BUT AIR AND WATER POLLUTION MAY BE.

163. MOST MINING DAMAGE IS RELATIVELY LOCALIZED IN NATURE.

- Acid drainage, mostly from coal mines, sulphur dioxide from metal smelters, and seepage or blowouts at offshore oil wells are exceptions.

- However, this does not diminish their significance;

  . when deposits occur in beautiful areas, a problem largely but not entirely restricted to metallics, choices must be made between incompatible uses

  . mineral exploration and production will often have a big impact, on their own or as the stimulus for other activity, because they are frequently the first industrial activity in an otherwise environmentally undisturbed area

    .. this is particularly true in sensitive and ecologically fragile areas like the Arctic.

164. THE CONSUMPTION OF BOTH FUEL AND NON-FUEL MINERAL PRODUCTS INVOLVES MAJOR POLLUTION PROBLEMS.[1]

165. ENVIRONMENTAL CONTROL OF MINING AND MINERAL PROCESSING WILL NOT BE EASY TO ACHIEVE.

- The growing demand for mineral products is such that damage may continue to increase in total even though it is reduced per unit of output.

- While many practices damaging to human health or to the environment can be modified without significant additional cost, in other cases large costs will be required.

166. IF ANY PROGRESS IS TO BE MADE IN AMELIORATING ENVIRONMENTALLY ADVERSE EFFECTS, MINERAL DEVELOPMENT PLANS SHOULD BE INTEGRATED WITH THE MANAGEMENT OF OTHER NATURAL RESOURCES AND SHOULD PROVIDE FOR THE CONSERVATION OF BOTH THE MINERAL AND THE ENVIRONMENTAL RESOURCES. TO THIS END, A NUMBER OF MANAGEMENT OPPORTUNITIES ARE USUALLY AVAILABLE.

- Sequential land use planning. Since all mines are eventually exhausted, mining should be planned as one of a series of land uses.

- Exploration. During exploration restrictions can be very stringent because there is no certainty that there will be any significant returns and because the costs of environmental protection are generally low.

- Siting. The fact that mining is inherently a temporary land use suggests that siting of other economic activities should be delayed to allow for the prior removal of valuable minerals. Where other activities predate mining, accommodation may or may not be possible. Further, even in uninhabited areas, the alternative of not mining must also be considered as legitimate and, in some cases, desirable.

- Economic land use. While mine site selection is more resource-bound than are most other forms of economic activity, there are ways to economize on the use of land during mineral production.

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[1] Problems connected with energy consumption are discussed in the section on energy. Problems stemming from use of non-fuel minerals, which with some exceptions such as fertilizers are less directly the source of pollution, are discussed under Subject Area III (A/CONF.48/8).

- Operational restrictions. Once a decision has been reached to allow mining, operational restrictions should be invoked to reduce the undesirable side effects as much as possible for each unit of output;

  - the main problems relate to proper disposal of waste materials - acid drainage, sediment from surface mines, flammable or radioactive wastes, and sulphur dioxide from smelters - to oil losses from undersea operations, and to subsidence, all of which can cause long-term or irreversible damages.

- Health care. The human suffering and tangible costs of such lung diseases as silicosis are so high, and the control methods so readily available, that it may be reasonable to aim for an incidence rate of zero;

  - because human susceptibility to lung diseases varies greatly, this will not actually be obtained, but if provision is made for early diagnosis of the incipient disease and transfer of susceptible individuals to other forms of employment, it becomes a meaningful target.

- Land reclamation. Mines should be planned and operated so as to make reclamation feasible;

  - there should be no continuing off-site damages after the mine has closed

  - the mine site itself, while possibly different in form and appearance from its pre-mining state, should be aesthetic and no less productive for other purposes than before mining

  - if reclamation to meet these two criteria appears to be excessively expensive at a proposed mine, a serious question must be raised as to whether the mine should be allowed to open at all.

- Recycling. More extensive recycling of obsolete mineral-based products should be encouraged;

  - to the extent recycling is employed, the problems associated with primary mining and processing are avoided

  - on the other hand, it must be remembered that the recycling process has its own demands for energy and materials and its own impact on the environment

  - recycling technologies must be advanced, some institutions and incentives created, and final products redesigned before the circle will in fact be closed.

(ii) Recommendations for national action

It is recommended that national governments give consideration to the following proposals.

167. COUNTRIES SHOULD ADOPT THE VIEW THAT MOST MINERAL EXPLORATION AND PRODUCTION ARE PARTS OF A SERIES OF SEQUENTIAL LAND USES. THIS VIEW SHOULD BE INTEGRATED WITH OTHER ASPECTS OF THE COUNTRY'S NATURAL RESOURCE MANAGEMENT PLANS.

168. EACH COUNTRY SHOULD DEVELOP FIRM POLICIES APPROPRIATE TO ITS GOALS AND ENVIRONMENTAL CONCERNS.

- These policies should cover:
  - . minimum environmental standards for each set of environmental conditions and
  - . special considerations that may modify the general standards
    - .. particular features, such as national parks
    - .. particular goals, such as the preservation of a rural society, or, conversely, the development of a planned mining region.
- These policies should be clearly set out in advance so that they become a force to which mineral proposals respond rather than be developed as a reaction to such proposals.
- These policies should also seek to add costs of environmental damage to production costs, so that producers will be encouraged to seek less damaging processes.
- In addition, they should be rooted as firmly as possibly in each country's legal and institutional framework rather than relying on ad hoc measures.

169. COUNTRIES SHOULD DEVELOP LAND-USE REGULATIONS THAT WILL PERMIT MINERAL EXTRACTION, AND SUBSEQUENT MINED-LAND RECLAMATION, PRIOR TO THE ADVENT OF OTHER ECONOMIC ACTIVITY THAT WOULD PRECLUDE MINING, EXCEPT FOR THOSE CASES WHERE MINING WOULD DESTROY OTHER RESOURCES DEEMED TO BE OF GREATER AESTHETIC, CULTURAL, OR ECONOMIC VALUE.

170. EACH NATION SHOULD VEST ITS PROPOSED LAND USE AGENCY WITH THE AUTHORITY TO IMPLEMENT THE PRECEDING RECOMMENDATIONS.

- With a single agency, there is more likelihood of an integrated approach rather than the mere transfer of problems from one domain to another.

- Each country should consider the advantages of granting this agency some degree of autonomy from mining interests, be these governmental or private.

171. FURTHERMORE GOVERNMENTS SHOULD

- Establish base lines of natural activity and monitor changes in actual and potential mining areas so that the impact of mining can be measured - and eventually predicted.

- Redirect part of their often extensive mining research programme to develop mining and processing methods that will avoid or reduce these impacts during mining, to determine how to stabilise waste disposal sites, and to search for ways in which the wastes can be put to beneficial use.

172. COUNTRIES SHOULD ADOPT THE STANDARD OF NO NEW INCIDENCE OF ADVANCED CASES OF OCCUPATIONAL LUNG DISEASE AND SET UP SYSTEMS FOR EARLY DIAGNOSIS OF THE DISEASE.

173. COUNTRIES SHOULD ADOPT RECLAMATION STANDARDS AND REGULATIONS TO THE EFFECT THAT ALL EXPLORATION ACTIVITY AND ALL MINING BE COMPLETED IN SUCH WAYS THAT THERE ARE NO CONTINUING DAMAGES.

17 . NATIONS SHOULD STUDY MEANS TO INCREASE THE RECYCLING OF MINERAL-BASED PRODUCTS AND, WHEREVER JUSTIFIED BY A CONSIDERATION OF THE COMPARATIVE COSTS, ENCOURAGE RECYCLING PROCESSES.

(iii) Recommendations for international action

175. IT IS RECOMMENDED THAT THE SECRETARY GENERAL PROVIDE THE APPROPRIATE VEHICLE FOR THE EXCHANGE OF INFORMATION.

- Improved accessibility and dissemination of existing information is required;

  . the body of literature and experience is already larger than one would think.

- Possibilities include the accumulation of information on:
  - the environmental conditions of mine sites
  - the action taken in respect to the environment
  - the positive and negative environmental repercussions.
- Such a body of information could be used for prediction. Criteria for the planning and management of mineral production would emerge and would indicate where certain kinds of mining should be limited, where reclamation costs will be particularly high, or where other problems will arise.

## H. Energy - Its processing, transportation and consumption

### (i) Considerations for action

176. ANY REMARKS ON THE ENVIRONMENTAL COSTS OF ENERGY MUST FIRST ACKNOWLEDGE ITS INDISPENSIBLE CONTRIBUTION TO THE PROGRESS OF SOCIETY.

177. EACH STAGE IN THE FLOW OF ENERGY, FROM PRODUCTION TO CONVERSION TO FINAL USE IN HOMES, FACTORIES OR MEANS OF TRANSPORTATION, IS ACCOMPANIED BY SECONDARY EFFECTS THAT, WHEN GENERATED IN SUFFICIENT VOLUME, EXERT AN ADVERSE IMPACT ON ONE OR MORE ASPECTS OF THE ENVIRONMENT.[1]

- At the stage of conversion to electricity, serious pollution problems abound through emission of noxious gases and particulates into the air and the discharge of hot water into rivers and lakes;
  - conventional thermal power plants must all contend with thermal pollution, and those based on coal or oil with emissions of gases and particulates; gas-based plants face less difficult problems in the latter respect
  - nuclear power plants, although they have been the object of greater scrutiny than any technology in the past, and although they offer certain environmental advantages over conventional thermal plants, require continuous surveillance of the most careful kind because of the large losses that could result from escape of radio-active matter
  - most recently, electricity generated in hydro facilities - which is generally considered a "clean" operation - has come under criticism because of
    - the spread of water-borne diseases
    - displacement of population
    - the often severe alterations in the ecology of the area newly occupied by man-made lakes.
- The main pollution problems in energy transportation are related to;
  - spillage of oil into the ocean, either by way of accident or deliberate act (e.g. ship-cleaning operations, runoff from disposal of lubricants on land)
  - pipeline safety, including both the explosion hazard where gas is transported and spillage where oil is transported
  - the as yet quite limited movement of radioactive fuel elements from fuel-processing facilities for reprocessing, and from both reactors and fuel plants to sites of spent fuel disposal

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[1] Primary production including refining has been treated in the previous section.

  - the disfiguring of landscapes by overhead transmission lines.
- The use of energy may be accompanied by highly significant pollution effects:
  - the most significant is probably the burning of liquid fuel in the internal combustion engine where large amounts of carbon monoxide, hydrocarbons and other combustion products are produced
  - where coal and oil are used for space-heating, the result of combustion again results in air pollution
  - fuel used directly by industry, especially the metallurgical and chemical branches, also contributes significantly to air pollution
  - mention must also be made of the inescapable generation and injection into the atmosphere of heat usually accompanying each stage of energy flow and in each variety of use.
- Particulates, carbon dioxide, and heat emissions appear to play a role in climate and weather modifications that is certainly of local significance and that may ultimately affect global climate.

178. THE ABOVE OBSERVATIONS SUFFICE TO SHOW THAT IT IS ESSENTIAL TO CONSIDER MULTIPLE CHOICES IN THE PLANNING AND MANAGEMENT OF ANY ENERGY ECONOMY.

- Each of many possible combinations of energy flow systems - different energy sources, conversion processes, transport modes and final applications - is associated with identifiable benefits, along with equally identifiable costs of environmental damage of required pollution control of safety precautions and of other impacts;
  - in recent years, a great deal has been done to identify and/or quantify various benefits and costs, and full advantage should be taken of this work.

179. THERE IS MUCH INTEREST IN THE SUBSTITUTION OF NEW, LESS-POLLUTING SOURCES OF ENERGY FOR CONVENTIONAL ONES.

- Fusion offers the promise of virtually unlimited raw material supply and very high efficiencies (thus less thermal pollution). It offers advantages over fission power in management of radioactive wastes although it may involve larger routine releases.
- Geothermal energy solar energy and wind and tidal power are other less polluting sources of promise;
  - however, they apply to a limited number of regions and the contribution they might make to the future world supply is not yet certain.

180. INVESTIGATIONS ARE ALSO BEING CONDUCTED INTO NEW CONVERSION PROCESSES THAT GENERATE LESS POLLUTION THAN DO PROCESSES NOW IN USE.

- At one level, work must proceed on the most promising of the new conversion processes, which either by reducing polluting potential at the point of consumption or by increasing system efficiency, provide a net reduction in pollution per unit of usable energy. Possibilities include:

    - magnetohydrodynamics; various combinations of gas and steam turbines; and other systems that convert heat to electricity more efficiently

    - batteries, fuel cells and exhaust combustion engine to replace the internal combustion engine

    - gasification or liquefaction of coal, with removal of polluting sulphur prior to combustion

    - fast breeder reactors, which result in less thermal pollution and reduce the need for new uranium mining.

- There must also be a second level objective in which entirely new energy production-distribution-consumption systems are reviewed, such as house-sized total-energy systems based on the fuel cell:

    - investigation of a wide range of such systems should be pursued

    - such research is speculative at this point and should be considered only by those countries that can afford it.

181. RESEARCH MUST INCLUDE A CAREFUL TECHNOLOGICAL ASSESSMENT OF ANY NEW METHOD, FOR ONLY THIS WILL REVEAL WHAT KINDS OF POLLUTION MIGHT COME IN ITS WAKE.

- Electric power from geothermal sources, often cited for its potential in some countries, may raise the problem of disposing of large flows of highly saline water.

- Rechargeable battery systems impose significant added demands on electric power facilities.

182. ENERGY TRANSPORT IS A SUBJECT EQUALLY SUSCEPTIBLE TO RESEARCH.

- The objective is to seek ways to minimize the impact, in both the construction and the operation phases, of pipelines, transmission lines, boat transport, and the like for each level of use;

    - such alternatives as the establishment of utility corridors as conduits for all conveyors of energy communications, etc., should be considered.

103. AMONG THE USES TO WHICH ENERGY IS PUT, THE AUTOMOBILE IS ONE OF THE MAJOR POLLUTERS, ESPECIALLY IN URBAN AREAS.

- The choice of transportation systems, particularly passenger-owned versus mass transportation, carries implications far beyond the provision for the movement of people.

- Similarly, a commitment to the internal combustion engine as the single or major propulsion system sets the stage for easily predictable pollution problems, pending the outcome of efforts to modify its characteristics.

104. SITING SHOULD BE DESIGNED TO MINIMIZE ENVIRONMENTAL IMPACT AT ANY LEVEL OF UTILIZATION. OFTEN THIS WILL ADD MINOR COSTS, BUT HELP AVOID HIGH REMEDIAL COSTS IN THE FUTURE.

- Experience suggests that it is only after pollution problems have arisen, usually in areas of high concentrations of population, or as the result of the environmental impact of very large installations, that the siting of new facilities receives attention.

- To avoid this timing trap, an extensive review of various alternatives involving economies of scale, patterns of land use, and environmental pollution should be made before deciding upon the siting of an energy producing facility.

- The configuration of human settlements is also an important siting consideration related to energy use.

105. ENERGY PRODUCTION AND TRANSPORTATION ARE PERHAPS UNIQUE IN RESOURCE MANAGEMENT IN THE EXTENT TO WHICH ACCIDENTS ARE A DANGER.

- Accidents in the course of nuclear generation and transportation and of liquid fuel production and transportation, in particular, can be very serious, at least locally:

    . the record is replete with tanker accidents and oil spills

    . there have been a few worrisome though minor incidents at reactors.

- Efforts must be made in proportion to the risks imposed to reduce the probability of such accidents.

106. ALL ALTERNATIVES FOR DOMESTIC FUEL AND SPACE-HEATING MERIT EXAMINATION.

- Countries have traditionally followed a sequence in sources of energy - commonly wood, coal, fuel oil, natural gas, and electricity - which might be reordered;

    these sources vary in their impact upon the environment and the alternative costs and benefits should be examined

.. the possibilities of central heating plants should also be examined, where appropriate.

- The possibilities of improved building design and construction should not be neglected.

- Developing countries should also consider moving directly to more environmentally efficient sources of space-heating.

197. THE ENERGY REQUIRED BY VARIOUS PRODUCTION PROCESSES, AND THE ATTENDANT ENVIRONMENTAL IMPACT, MUST BE CONSIDERED.

- The external costs arising from the energy required should be evaluated prior to the decision to introduce a new product onto the market and should be reflected in its price.

- The substitution of products with increased energy demands should be closely examined and possibly reconsidered.

198. SOME CONSIDERATION HAS TO BE GIVEN TO THE OBJECTIVE OF SLOWING DOWN THE RATE OF GROWTH OF ENERGY-CONSUMPTION, WHERE HIGH LEVELS HAVE ALREADY BEEN ACHIEVED.

- This becomes necessary because certain adverse effects of energy use, notably problems related to heat and gaseous emissions, appear to be intrinsic to energy use and because higher costs resulting from the depletion of cheap energy sources (a possibility for fluid fossil fuels) could limit development plans of developing countries.

- This objective must be posed very carefully, for energy growth has been closely associated with higher levels of economic development and material well being:

  . it should in no way be applied in a manner which would slow development in the majority of nations still requiring more energy.

- Nevertheless, it can be approached

  . by all nations observing greater efficiency in the use of energy per unit of final product (higher conversion ratios, lower heat losses, etc.)

  . by those areas already well supplied questioning the need for per capita additions to energy consumptions.

- Changes in the price structure and other measures to encourage lower use might do much to achieve this objective.

### (ii) Recommendations for national action

It is recommended that national governments give consideration to the following proposals.

189. EACH NATION SHOULD SET UP A NATIONAL ENERGY BOARD TO COORDINATE ENERGY DEVELOPMENT AND UTILIZATION POLICIES, STAFFED WITH HIGHLY QUALIFIED PERSONNEL, INCLUDING SOME IN THOSE DISCIPLINES RELATING TO THE ADVERSE ENVIRONMENTAL EFFECTS OF ENERGY.

- If such a national agency is not feasible it is recommended that each nation adopt a coordinated energy policy, so as not to forget environmental considerations;

  . this is all too often the result when there are competing single-purpose agencies, each responsible for a different form of energy

  . coordination will also have other benefits.

190. THOSE GOVERNMENTS WITH HIGH PER CAPITA USE SHOULD CONSIDER THE OPPORTUNITIES FOR REDUCING THE GROWTH OF ENERGY CONSUMPTION AS ONE OF THE ALTERNATIVES IN MINIMIZING ALL OF THE COSTS - DIRECT, ENVIRONMENTAL AND CULTURAL - FROM ECONOMIC DEVELOPMENT.

191. COUNTRIES SHOULD ALSO DEVELOP EXPLICIT TRANSPORTATION POLICIES AND INTEGRATE THESE WITH CONSIDERATIONS DEVELOPED ABOVE.

192. COUNTRIES SHOULD PROMOTE ECONOMIC AND TECHNOLOGICAL RESEARCH CAPABILITIES FOR DEVELOPING OR ASSESSING NEW ENERGY SYSTEMS OR FOR DETERMINING THE BEST OR IMPROVED USE OF EXISTING SYSTEMS.

- Within industrial nations, this effort should take place on a large scale and include basic research programmes that have no short-run returns but involve desirable long-term reorientation;

  . it is important that the implications to energy consumption of product substitution be examined

  . research and development of new conversion processes should receive high priority

  . the effort to determine the technological feasibility of fusion power should be strongly supported in order to see whether development is merited.

- In developing nations, the focus should be more on the solution of their particular energy constraints, generally by highly applied research on practical problems;

  . countries should study the alternatives in order to determine the most appropriate combination of systems for different uses.

- In either case, as emphasized above, careful technological assessments must be made of the environmental impacts of any proposed change in energy economics or technology.

193. COUNTRIES SHOULD DEVOTE SPECIAL ATTENTION TO MINIMIZING ENVIRONMENTAL IMPACTS WHEN SITING ENERGY PRODUCTION, CONVERSION AND TRANSPORTATION FACILITIES.

- Appropriate review and appeal procedures should also be established.

194. EACH NATION SHOULD ALSO SET UP OR, IF THEY ALREADY EXIST, REVIEW THE EFFECTIVENESS OF AGENCIES TO ADMINISTER MINIMUM STANDARDS IN AREAS WHERE ACCIDENTS MUST BE CONTROLLED.

- Because of the possible conflicts, the functions of promoting and regulating each source of energy should be vested in separate agencies.

195. DESPITE BEST EFFORTS, A FINITE PROBABILITY OF ACCIDENTS MUST REMAIN. FOR THIS REASON, EACH NATION MAY WISH TO SET UP A POLLUTION CRISIS CENTRE TO DEAL WITH ACCIDENTS.

- Such a centre need only be a "skeleton organization" but must have strong communications links and the authority to command what it needs to cope with accidents and prevent damage from spreading.

- Equipment not readily available should be held on reserve in high-risk areas for mobilization during such accidents.

(iii) Recommendations for international action

196. IT IS RECOMMENDED THAT THE SECRETARY GENERAL TAKE STEPS TO:

(a) ENSURE PROPER COLLECTION, MEASUREMENT AND ANALYSIS OF DATA RELATING TO THE ENVIRONMENTAL EFFECTS OF ENERGY USE AND PRODUCTION WITHIN APPROPRIATE MONITORING SYSTEMS.

- The design and operation of such networks should include, in particular, monitoring the effects of emissions of carbon dioxide, sulphur dioxide, heat, and particulates, as well as the effects of releases of oil and radioactivity;

- In each case the objective is to learn more about the effects on weather, human health, plant and animal life, and amenity values.

(b) GIVE SPECIAL ATTENTION TO PROVIDING A MECHANISM FOR THE EXCHANGE OF INFORMATION.

- Clearly, to rationalize and integrate resource management for energy will require a solid understanding of the complexity of the problem and the multiplicity of alternative solutions.

- Access to the large body of existing information should be facilitated;

- data on the environmental consequences of different energy systems should be provided through an exchange of national experiences, studies, seminars, and other appropriate meetings

- a continually updated register of research involving both entire systems and each of its stages should be maintained.

(c) ENSURE THAT A STUDY BE UNDERTAKEN ON AVAILABLE ENERGY SOURCES AND CONSUMPTION TRENDS IN ORDER TO PLAN FOR AND FORECAST THE ENVIRONMENTAL EFFECTS OF FUTURE USE.

## Chapter III

## SUMMARY OF RECOMMENDATIONS FOR INTERNATIONAL ACTION

197. The principal objective of international action in this subject area is to support national efforts towards a more rational and integrated management of natural resources which takes account of environmental concerns.

198. For the convenience of governments, the recommendations for international action which appear in Chapter I and under each principal resource sector of the preceding Chapter II are summarized below. These recommendations have been re-grouped by function (e.g. research, monitoring, information exchange) so as to provide the reader with an over-all view of the scope of the measures for the management of natural resources which are submitted to the Conference.

199. Since there are already in operation agencies and mechanisms which provide many functions that fall into the natural resources area, the recommendations cover principally those objectives that are not now served, partly or wholly.

### A. Acquisition of knowledge

### (i) Evaluation and review

200. The impact of resource development upon the environment should be examined periodically during the planning and management process. Conflicts with other social objectives could thereby be identified and the most appropriate means of development selected.

201. It is recommended that the Secretary-General, in co-operation with governments concerned, take the following steps:

(a) arrange that systematic post audits of completed natural resource development projects be undertaken in representative ecosystems of international significance;[8]

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[8] Projects might include new agricultural settlement of sub-tropical and tropical zones, irrigation and drainage in arid zones, tropical forestry development, major hydroelectric developments, land reclamation works in tropical lowland coastal areas, and settlement of nomads in semi-arid zones. The cost of post audits in developing countries should not be imputed to the costs of the resource development projects but financed from separate international sources.

(b) provide that pilot studies be conducted in representative ecosystems of international significance to assess the environmental impact of alternative approaches to the survey, planning, and development of resource projects;

(c) prepare a comprehensive assessment and evaluation of the actual and potential environmental effects of water management upon the oceans;

(d) ensure that a programme to expand present data gathering processes so as to assess the total economic value of wildlife resources, is established.

(ii) Research

202. International support for research, study, and demonstration projects should be mobilized where there are serious gaps of knowledge which individual governments are unable to fill independently or which relate to common property resources.

203. It is recommended that the Secretary-General take steps to ensure that:

(a) the United Nations bodies concerned co-operate to meet the needs for new knowledge related to the environmental aspects of forest management;

(b) international development assistance agencies, in co-operation with recipient governments, intensify efforts to revise and broaden the criteria of development project analysis to incorporate environmental impact considerations;

(c) a study on the relative costs and benefits of synthetic and natural products serving identical end uses be launched;

(d) the international programme of biosphere research be vigorously pursued;

(e) a study be undertaken on available energy sources and consumption trends in order to plan for and forecast the environmental effects of future energy use.

204. It is recommended that WMO initiate or intensify studies on the interrelationships of resource development and meteorology.

205. It is recommended that FAO co-ordinate and strengthen international co-operative research on soil capabilities and conservation.

(iii) Monitoring

206. Co-operative surveys or monitoring systems should be established to assist nations to assess their resources and control possible degradation.

207. It is recommended that the Secretary-General, in co-operation with interested Governments, take the necessary steps to develop further remote sensing techniques in order to implement resources surveys and to ensure that the use of remote sensing devices be shared, where appropriate.

208. It is recommended that the Secretary-General take steps to ensure that

(a) continuing surveillance of the world's forest cover is provided for through the establishment of an appropriate monitoring system;

(b) the collection, measurement and analysis of data relating to the environmental effects of energy use and production is undertaken within appropriate monitoring systems;

(c) the effects of pollutants upon wildlife are considered, where appropriate, within environmental monitoring systems.

(iv) Information exchange

209. Large bodies of knowledge already exist in different parts of the world on many natural resource subjects. Measures should be adopted to ensure that the appropriate information is transferred to those who need it and can apply it.

210. It is recommended that the Secretary-General:

(a) provide the appropriate vehicle for the exchange of information on the environmental impact of mining and primary mineral processing;

(b) give special attention to providing a mechanism for the exchange of information on the environmental impact of energy processing, transportation and consumption;

(c) ensure that an appropriate mechanism exists for the transfer of information on park legislation and planning and management techniques developed in some industrialized countries which could serve as models to be made available to any interested developing country;

(d) provide for the co-ordination of information transfer regarding water-related technologies and techniques now shared by several agencies.

211. It is recommended that FAO:

(a) strengthen the transfer of information on forest and forest management;

(b) strengthen, in co-operation with other international agencies concerned, the necessary machinery for the international transfer of experience on soil capabilities, degradation, and conservation.

B. International agreements

212. International agreements are required to regulate the development or use of resources considered to be of direct interest to more than one nation.

213. It is recommended that governments take steps to reach agreements to:

(a) co-ordinate and co-operate on the management of shared protected areas;

(b) set aside for protection areas representing ecosystems of international significance;

(c) enact international conventions and treaties to protect species inhabiting international waters or those which migrate from one country to another;

(d) sign the proposed convention on the export, import, and transit of certain species of wild animals and plants;

(e) sign the proposed conventions on conservation of wetlands of international importance, conservation of certain islands for science, and conservation of the world heritage;

(f) give attention to and, where required, implement the guidelines and recommendations on fisheries elaborated by various intergovernmental organizations and international bodies.

214. It is recommended that governments agree to strengthen the International Whaling Commission and to consider an international agreement calling for a 10-year moratorium on commercial whaling.

215. It is recommended that Governments, the Secretary-General and FAO ensure close participation of fishery agencies and interests in the preparations of the UN Conference on the Law of the Sea.

### C. Supporting measures

#### (i) Training

216. Training will frequently require support from the international community in order to ensure that the available information is properly applied. Clearly, additional training would be beneficial in nearly all disciplines associated with natural resources management. Special attention is, however, called to the need for training in protected areas which appear particularly barren and in wildlife management.

217. It is recommended that Governments and the Secretary-General give special attention to training requirements for protected areas.

218. It is recommended that the Secretary-General ensure that the appropriate United Nations agencies co-operate with the Governments of the developing countries to develop special short-term training courses on wildlife management.

### (ii) Technical and financial assistance

219. It is recommended that the Secretary-General:

(a) ensure that the United Nations system is prepared to provide technical and financial assistance to governments upon request in water resource management;

(b) establish a roster of experts who would be available to assist governments, upon request, to anticipate and evaluate the environmental effects of major water development projects;

(c) ensure that the appropriate UN agencies assist the developing countries to plan for the inflow of visitors into their protected areas, in such a way as to reconcile revenue and environmental considerations.

220. It is recommended that FAO under its programme "War on Waste" place increased emphasis on control and recycling of wastes in agriculture.

### D. Organizational recommendations

221. New organisations will sometimes be required to facilitate the management of a common resource or to assist governments with similar resource problems.

222. It is recommended that Governments concerned consider the creation of appropriate multinational institutions in the form of international river-basin commissions, for water resources common to more than one jurisdiction.

223. It is recommended that the Secretary-General take steps to ensure that specialized centres on water-related environmental problems be established.

224. It is recommended that Governments, in co-operation with FAO, strengthen the existing international and regional machinery for development and management of fisheries and their related environmental aspects and - in those regions where these do not exist - encourage the establishment of fishery councils and commissions as appropriate.

### E. Comprehensive programmes

225. In response to a particular resource problem, programmes are sometimes required that provide technical and financial assistance at several stages of the process of information acquisition and application.

226. It is recommended that Governments, FAO and WHO, in co-operation with UNESCO and IAEA, strengthen and co-ordinate international programmes for integrated pest control and for the reduction of the harmful effects of agro-chemicals.

227. *It is recommended that* FAO:

(a) co-ordinate an international programme for research and the exchange of information on forest fires, pests, and diseases;

(b) expand its present programme on the stabilization of marginal lands;

(c) further develop and strengthen facilities for collecting, analyzing and disseminating data on living aquatic resources and the environment in which they live.

228. *It is recommended that* Governments agree to an International Programme to preserve the world's genetic resources.

229. *It is recommended that* the Secretary-General, in co-operation with the UN organizations concerned, takes the necessary steps to ensure international co-operation in the research, control and regulation of the side effects of national activities in resource utilization where these affect resources of other nations.

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# Identification and control of pollutants of broad international significance

(subject area III)

only one earth

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# IDENTIFICATION AND CONTROL OF POLLUTANTS OF BROAD INTERNATIONAL SIGNIFICANCE

(Subject Area III)

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## Chapter I

## THE BIOSPHERE AS CONTEXT

1. The context within which this paper considers pollution is the biosphere, a thin surface layer, less than one hundredth of the Earth's radius in thickness. It comprises all living things and the terrestrial environment with which they interact. In its millions of years of evolutionary history, the biosphere has become organized essentially as a great "machine" that intercepts radiant energy from the sun, converts it into chemical energy through photosynthesis and distributes it in various ways. By these means it maintains structured ecosystems such as forests, meadows, meadows, lakes, rivers and oceans. Each such system includes primary producers such as green plants, consumers such as herbivores and successive orders of predators, and decomposers.

2. Only plant life, whether terrestrial or aquatic, has the capacity to trap the energy of sunlight and use it in photosynthesis, combining carbon dioxide and water to form carbohydrates which - together with nutrients assimilated by plants from soil, air and water - constitute the energy-containing organic matter and oxygen that support animal life. Herbivores and predators distribute that organic matter and the energy it contains. Bacteria and other decomposers break down dead organic matter, making the elements it contains available once again for use by plants.

3. The chemical elements necessary for life circulate throughout the biosphere in vast cycles. Their transfer on a large scale is brought about by the ceaseless circulation of air and water and the slow erosion and even slower uplift of land masses. On the immediate scale is the more intimate cycle of photosynthesis, respiration (which provides energy and releases carbon dioxide to the atmosphere) and decomposition.

4. The survival of all living things therefore depends on the integrity of this cycle which is underlain by the presence on Earth of an atmosphere and of oceans of remarkably stable composition whose movements and relations are also ultimately due to the absorption of solar energy. Anything that interferes with these complex mechanisms of energy absorption and redistribution may affect life on Earth in some way or other.

5. As life evolved, it slowly modified the nature of the Earth's surface. The biosphere has both contributed to and been altered by this continuing evolutionary process. Man, however, has deliberately influenced these processes and, as his numbers have increased, his impact on the environment has also increased. Until recently, aside from changes in local environments, his exploitation of the biosphere did not endanger its capacity to support an increasing human population. The by-products of human activities were largely naturally occuring organic or mineral materials that eventually were reintegrated into the major cycles. Now, however, large-scale modifications of the biosphere are appearing, within time spans that are crucially brief in relation to the pace of the evolutionary process. The long-term consequences of such man-made changes are hard to predict.

6. Since all life is interdependent, any change that seriously interferes with any living system or biogeochemical cycle can have a major impact on life as a whole. Man is not an independent actor performing against a background of something called Nature; he is a part of nature. In the past few years, the lesson has begun to be learned anew. Man is beginning to realize that the Earth's ability to deal with pollution is not unlimited, and that the systems that support life are already being overtaxed in certain areas.

## Chapter II

## THE NATURE AND EXTENT OF POLLUTION PROBLEMS

7. Human activities inevitably and increasingly introduce material and energy into the environment; when that material or energy endangers or is liable to endanger man's health, his well-being or his resources; directly or indirectly, it is called a pollutant. This definition suggests that desirable activities can produce undesirable side effects, and indeed that is true even of great achievements in preventive medicine, in agriculture and in industrial development that have benefitted mankind. To look at it in another way, a substance may be considered a pollutant simply because it is in the wrong place, at the wrong time, and in the wrong quantity.

8. It must also be appreciated that air, water and food always contain varying amounts of "foreign" matter, and in this sense, the potential for pollution has always been present. When we say that something is polluted, we are in fact making a value judgement about the quality or quantity of foreign matter present. This judgement may be based on objective facts, but it also depends on other value judgements that vary with social and economic circumstances. Similarly, the subsequent decisions as to what to do about any given pollution situation also depend on local value judgements.

9. Finally, it must be emphasized that one of the most widespread, and the oldest, forms of pollution is that arising from contamination of the environment, and especially of food and water supplies, by pathogenic organisms. Despite the advances that have made it possible to control many of the diseases that afflicted mankind in the past, the problem of "biological" pollution has been amplified, particularly in developing countries, by increasing population and urbanization, with the attendant need for large-scale disposal of human was, and by changes in land use and irrigation practices.

10. The present world-wide concern about pollution arises from the realization that to-day's problems, originating essentially from human activity, are very much greater in magnitude, and far more widespread, than ever before; because of this, they are also very different in nature. There is, further, the widespread feeling that something must be done about pollution, and with it, the realization that something can be done, because

man has scientific knowledge and technological capabilities that he did not have in the past. Not only does he know much more about pollution, but he also has the capability to organize his society and to shape its future; these things are essential if pollution is to be brought under control.

## A. Problems in industrialized and developing countries

11. In addition to the prevailing natural conditions, three factors in particular determine the magnitude and nature of the pollution problem, whether at the local or global level: the size of human population, the rate of production and consumption, and the level and use of technology. But while the total stress resulting from these factors is increasing, the capacity of the environment to deal with their side effects is finite. It is for this reason that pollution, the particular side effect with which we are dealing here, must be controlled.

12. Pollution of one sort or another occurs throughout human society, and the effects of any given pollutant are frequently the same wherever they are felt. It is true that the present situation results principally from the unbridled application of technology in the industrialized countries. The developing countries, however, are already affected by this situation and with increasing industrialization and urbanization they are encountering the same problems and having to deal more and more with the same pollutants. At the same time, it is also true that the stage of development affects both the perception of pollution as a problem and the resources and priority assigned to dealing with it.

13. There is one very important difference between the pollution problems - and indeed, the environmental problems as a whole - of the industrialized and the developing countries. In the former, the present problems result largely from significant (and increasing) affluence. In the latter, they are inherent factors in a continued state of poverty; this becomes apparent when one realizes that the principal pollution problems in the developing countries are health hazards due to inadequate sanitary facilities. With regard to pollution prevention and control, the developing countries are in a potentially favourable situation, in as much as answers to their present problems can in large measure be provided by development itself. At the same time,

by drawing on the experience of the more industrialized countries, they should be able, as their own industries expand, to avoid the mistakes and malpractices that have characterized industrial development hitherto and led to the present pollution crisis.

## B. How pollutants affect man

14. There are many ways of thinking about pollution hazards, but probably the first requirement is to recognize the different ways in which pollutants can affect man, directly or indirectly.

Among the direct effects are the following:

- acute effects from exposure to a toxic pollutant reaching man through air, water or food;
- long-term effects due to prolonged exposure to a pollutant at levels lower than those giving rise to overt toxic effects;
- acute or long-term effects due to synergistic interaction between pollutants or between a pollutant and such factors as malnutrition and disease;
- genetic effects that a pollutant may induce in the germ cells of an exposed individual but that manifest themselves in his descendants, sometimes several generations removed.

15. Indirect effects on man may result from reduction of the food supply, deterioration of the habitat, or alteration of the climate. Such effects include:

- actual reduction of the food supply when a pollutant kills food plants or animals, renders them liable to disease, or makes the product unfit for consumption;
- elimination by a pesticide or herbicide of the natural enemies of a hitherto harmless species, allowing it to proliferate and become a pest;
- damage to the human habitat resulting from air pollution that destroys forests or corrodes buildings; from oil that fouls beaches or industrial wastes that make inland waters unusable for recreation; etc.
- alteration of the global climate from a number of causes. This however is generally considered as a threat for the future rather than an actual effect of present pollution.

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16. It is extremely important to distinguish between direct and indirect effects on man. In certain situations, the indirect effects, which are often the most difficult to detect and the easiest to overlook, may be the most important of all.

(i) Approaches to the identification of pollutants

17. Pollution can be viewed in a number of ways, each of which may be useful at one time or another. One may start by considering the polluting agents - biological agents, chemical pesticides, excess heat, noise - and group them accordingly. The polluting activity may be examined on a geographical basis ... is it local, regional, global? Pollutants may be considered with regard to a specific part of the biosphere ... the air, the land, or the oceans. They may be classified by their direct or indirect effects, perhaps through a whole biological cycle or food chain, or on individual elements such as a local human population. Moreover, while the ultimate effect on man is usually the paramount point of interest, the nature of the biosphere is such that the effect on some other organism or natural resource may be of immediate concern.

18. Given these general considerations, there are two different approaches to the identification of individual pollutants. One is to assume that the substance under examination is not harmful, until the evidence indicates otherwise. The other method is to consider any such substance, or at least any new chemical substance, as potentially harmful, and to treat it as such until found otherwise. The debate as to which approach should be followed is a fruitful and essential part of the whole decision-making process and involves economic and political considerations as much as scientific knowledge.

19. Finally, in attempting to foresee future pollution problems one should consider the particular properties of substances that are likely to make them significant pollutants. In the case of chemical substances, particularly new ones, widespread or large-scale input into the biosphere is at once suggestive of hazard when associated with toxicity to plants or animals, including man, persistence in the environment or in tissues,and mobility (through atmospheric or oceanic transport, weathering or leaching from soils, or transmission through food chains).

20. The sources, distribution, and effects of major pollutants with these characteristics are given in table 1 of chapter III.

(ii) Some major themes

21. At present, our knowledge of many aspects of pollution and pollutants is very incomplete. New research findings, and fresh interpretations of existing data, result in a fluid situation as regards both information and opinion. Nevertheless, certain major themes do emerge that require the attention of the participants in any Conference concerned with pollution.

22. It has already been pointed out that Pollution is not an absolute concept. An essential pesticide on one man's farm may be a pollutant in his neighbour's fishpond. What are industrial wastes at one time and place may be valued by-products at another. Enough fertilizer is a nutrient, but too much may become a pollutant. However, a point has now been reached where pollution is beginning to affect the whole of mankind, and it is realized that a major re-orientation is required in much of our thinking as regards its effects on the biosphere and indeed, on human life in general.

23. Not all of the actions required are restrictive, and many of them are a matter of economic planning and costs rather than legislation. The economic aspects are dealt with later, but some general observations are relevant here. For example, the more complete utilization of resources through recycling techniques, and the more efficient production and use of energy can lead to major reductions in the emission of many pollutants. Other reductions can be made by changes in patterns of production and types of product. Modifications in economic incentive systems and institutions can lead to improved management of residues from production and consumption. But it must be realized that it will take a long time to deal with existing effects - and sources - of pollution, especially those that result from large-scale activities involving well-established technologies.

24. For these reasons, it is important that the awareness of industrial activity as the major cause of pollution should not lead to a fear of technological advance. Technology makes it possible for us to identify many of the more insidious forms of pollution; it is for governments to help direct the course of technological advance, apply and control it to reduce and avoid pollution.

25. Above all, pollution must be seen as a world problem, and its control as a task for all nations.

## Chapter III

## CHARACTERISTICS OF SOME MAJOR POLLUTANTS

26. Hundreds of new chemicals are made every year; some are persistent substances; many are used on a world-wide scale. Their use includes the production of new plastics and plasticizers for a wide variety of purposes; synthetic detergents and solvents; additives to foods, fuels or alloys; and pesticides. Many of them enter directly or indirectly into food, and more may reach surface and underground water supplies or be released into the atmosphere, and pass eventually into the oceans.

27. Out of this multitude of possible pollutants a number of substances have been identified as having a major impact on human health, ecosystems and the environment in general. Some of them have been studied in greater detail and their levels in the environment monitored systematically. The information on others is insufficient at this time, their distribution and concentration levels are known only partly and the effects of low but protracted exposure are inadequately documented. Moreover, space limitations prevent the inclusion here of anything other than minimal basic information even where this is available.

28. Selected environmental pollutants have been listed in Table 1. The listing implies no actual priority or relative importance of pollutants. It is not exhaustive nor is the information supplied complete. The intention is to illustrate the type of effects some classes of pollutants may have on man and his environment. The approximate levels listed give an order of magnitude only and the effects referred to are typical for the pollutant. Some information on chemistry and on environmental inter-actions has been included to help in the understanding of the distribution, biological or other accumulation and various interactions and changes which pollutants undergo after release.

29. Many pollutants may have been omitted because our knowledge is insufficient, they are not typical of a class of pollutant, they are not sufficiently stable to present a long-term hazard, or because they are confined to the vicinities of their release.

30. No attempt has been made at consistency in the units of concentration; they are mainly quoted as found in the literature, but space limitations preclude giving precise references. In general, an attempt has been made to give the latest available information and data as of December 1971. However, because our knowledge of the nature and modes of operation of most pollutants is advancing rapidly and continuously, the information given should be checked against the results of new research.

31. The pollutants listed have been grouped in loose categories. The criteria for grouping differ: some pollutants are grouped together because they appear mainly in one phase, for example, air; others have similar chemical or toxicological properties; still another group contains pollutants such as oil, degradable organic matter, and odours which are complex mixtures of various substances, only partly identified. Pathogenic micro-organisms are an important separate group of pollutants. Only some of them have been listed because they are associated with water-borne diseases such as cholera, hepatitis, food poisoning, etc. The last group listed are so-called physical pollutants which exert their influence by introducing excess energy into the environment (radiation, heat, noise).

TABLE

SELECTED ENVIRONMENTAL POLLUTANTS

| POLLUTANT | PRINCIPAL MAN-MADE SOURCES | DISTRIBUTION IN THE ENVIRONMENT | APPROXIMATE LEVELS | RELEVANT CHEMISTRY AND ENVIRONMENTAL INTERACTIONS | EFFECTS ON MAN'S HEALTH | EFFECTS ON THE ENVIRONMENT | REMARKS |
|---|---|---|---|---|---|---|---|
| Carbon dioxide ($CO_2$) | Carbonaceous fuel combustion for energy production, heating and transport.<br>Estimated global emission from combustion about 1.5 x $10^{13}$ kg/year | Air and water (global) | Normal atmosphere ~320 ppm<br>Rate of increase ~0.6 ppm/year | a. Biological processes provide a natural system for uptake and replenishment of $CO_2$.<br>b. The mass of $CO_2$ in the ocean layer which is in exchange with the atmosphere is 5-8 times the mass of $CO_2$ in the atmosphere. | Only indirect through possible modification of global climate. | Possible increase in earth's surface temperature (long-range effect). | Normal constituent of the atmosphere essential for plant life. |
| Carbon monoxide (CO) | Incomplete combustion of carbonaceous matter (motor vehicles, industrial processes, solid waste disposal, forest fires).<br>Estimated global emission from technological sources and forest fires, about 2.5 x $10^{11}$ kg/year | Air (local and regional) | Very variable depending on local conditions. Maximum values close to heavy traffic range from 20-120 ppm[1]. Average values in urban air from less than 1 to about 10 ppm. | CO is oxidized very slowly in the lower atmosphere. It is essentially chemically inert not reacting with other constituents of urban atmosphere to a significant degree. | a. Block of haemoglobin deprives the tissues of oxygen. Individuals suffering from cardio-respiratory disease are more sensitive. Psycho-physiological effects possible at low concentrations.<br>b. Smoking is an important source of human exposure perhaps more significant than traffic exposure. | No effects on higher plant life at concentrations below 100 ppm (1-3 weeks exposure). | a. Several natural sources (geophysical and biological) identified but their contribution to the global balance of CO estimated to be small.<br>b. Small amounts produced in man and animals as a by-product of heme catabolism. |
| Sulphur dioxide ($SO_2$) | Energy and heat production from sulphur containing fuel. Industrial processes.<br>Estimated global emission about 1.5 x $10^{11}$ kg/year | Air (water) (local and regional) | Annual averages in polluted urban areas up to 0.1-0.15 ppm. | a. Reducing type of air pollutant mainly formed by thermal oxidation of sulphur present in the fuel or sulphur-bearing ore.<br>b. Atmospheric oxidation to $SO_3$ results in the formation of sulfuric acid mist and sulfates.<br>c. Absorption and chemical reactions with suspended particles. | In combination with air borne particles (smoke) aggravates existing respiratory diseases and contributes to their development. | a. Chronic plant injury (0.03 ppm, annual average); susceptible species affected at 0.3 ppm for 8 hours; sulfuric acid mist produces leaf damage at 0.1 mg/m$^3$.<br>b. Reduced visibility (sulfuric acid mist and sulfates).<br>c. Deterioration of materials, increased corrosion rate (largely due to sulfuric acid).<br>d. Acidification of lakes and soils. | Natural sources such as volcanic gases contribute about 20% of the total $SO_2$ in the atmosphere (global balance). |
| Airborne particles | Fuel combustion for heating and energy production, industrial processes, solid waste incineration, motor vehicles and other transport. Agriculture and forestry burning.<br>Estimated global smoke emission, about 2 x $10^{10}$ kg/year. | Air (local, regional and global) | Annual averages in urban areas 40-400 µg/m$^3$ | Chemically a most diverse class of substances. Because of their physical behaviour related to particle size (surface and optical properties, motion) usually grouped together. | Synergistic effects with gaseous pollutants such as $SO_2$; possible toxic effects depend on chemical composition (e.g. lead, asbestos). | a. Reduction of direct sunlight and visibility; increased cloudiness and frequency of fogs; (these phenomena considerably affect amenity).<br>b. Damage to materials, and soiling.<br>c. Possible reduction of earth's temperature (long-range effect). | Natural sources: (dust storms and desert areas; volcanic eruptions, evaporation of sea spray (sea-salt)). Stratospheric particles are mainly of natural origin. |

| POLLUTANT | PRINCIPAL MAN-MADE SOURCES | DISTRIBUTION IN THE ENVIRONMENT | APPROXIMATE LEVELS | RELEVANT CHEMISTRY AND ENVIRONMENTAL INTERACTIONS | EFFECTS ON MAN'S HEALTH | EFFECTS ON THE ENVIRONMENT | REMARKS |
|---|---|---|---|---|---|---|---|
| Oxides of nitrogen ($NO_x$) | Oxidation of atmospheric nitrogen at high temperature (internal combustion engines, furnaces, incinerators), industrial processes; forest fires.<br>Estimated global emission from combustion sources including petroleum refining, about 5.3 x $10^{10}$ kg/year. | Air (local and regional) | Usually less than 0.1 ppm; in heavy traffic up to 1 ppm. Marked diurnal patterns. | $NO_x$ represents the sum of NO and $NO_2$. NO is the major oxide present in combustion emissions. Photochemical oxidition of NO in the presence of hydrocarbons produces irritants like peroxyacylnitrates. | Little information available at ambient concentrations; possible increase in acute respiratory infection and bronchitis morbidity in new-born children. | a. Brown haze in city air.<br>b. Levels which cause acute injury to plants are above those normally found in the atmosphere. Localized destruction of forests near large industrial sources.<br>c. Damage to materials. | |
| Volatile hydrocarbons and their products | Partial combustion of carbonaceous fuels (motor vehicles, stationary fuel combustion); industrial processes; solid waste disposal; solvents; forest fires. | Air (local and regional) | In highly polluted areas, maximum 1-hour values up to 10 ppm (as carbon) | Unreacted and partially oxidized products from the original fuel and substances formed by bond-rupture and subsequent re-synthesis. Reactive compounds such as alkenes play an important part in formation of oxidizing type of pollution. | Most of the effects are caused by compounds derived from atmospheric reactions of hydrocarbons, their derivatives and other substances (e.g. $NO_x$). Some oxidation products are eye irritants (acrolein, aldehydes). | a. Some compounds, e.g. ethylene, are very phytotoxic (sensitive plants are injured at 0.005 ppm).<br>b. Reduced visibility due to aerosol particles, particularly as a consequence of atmospheric reactions.<br>c. May produce unpleasant odours and affect amenity. | This group comprises hydrocarbons which appear in the atmosphere in gas phase. Polycyclic aromatic hydrocarbons are not included. |
| Oxidants including ozone | Emissions from motor vehicles. Photochemical reactions of oxides of nitrogen and reactive hydrocarbons. | Air (local) | In highly polluted areas up to 0.15 ppm (8-hour average); strong diurnal and seasonal variations. | Secondary air pollutants produced by photochemical reactions of oxides of nitrogen with hydrocarbons. Oxidizing type of air pollution. A complex mixture of gaseous pollutants and aerosols ($O_3$, $NO_2$ peroxyacyl nitrates (PAN), free radicals, aldehydes ketones polymerised hydrocarbons etc.). | a. Eye irritation<br>b. Possibly associated with asthmatic attacks.<br>c. Impaired pulmonary function in diseased persons. | a. PAN injures sensitive plants such as tobacco, tomato at levels 0.01-01. ppm (1-8 hours exposure).<br>b. Ozone considered one of the most damaging air pollutants for plants.<br>c. Damage to materials, particularly rubber, textiles and metals.<br>d. Pronounced reduction in visibility.<br>e. Affect amenity. | Ozone is a natural and essential constituent of the upper atmosphere (few ppm). |
| Fluorides | Industrial processes (production of aluminium, steel, phosphate fertilizers, fluorinated hydrocarbons, brick-making). Combustion of coal. Industrial liquid wastes and agricultural run-off. | Air (local) water, soil, food | a. Average concentrations reported for a number of cities (USA) varied from about 0.001-0.02 ppm.<br>b. Natural waters - very variable, range 0-20 mg/l.<br>c. Food - very variable range 0.1-20 mg/kg. | Fluoride ion is an inhibitor for a number of enzymes. | Beneficial in small concentrations e.g. 1 mg/l in drinking water decreases incidence of dental decay. At larger levels (daily intake 2-8 mg) mottling of teeth; at still higher levels possible skeletal damage. | a. Fluorosis in grazing animals.<br>b. Toxicity to fish varies widely depending on species.<br>c. Injury to vegetation at concentrations of 0.002 ppm in air.<br>d. Corrosion of metals, attack a wide range of building materials. | |

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|---|---|---|---|---|---|---|---|
| Odourous air pollutants | Industrial processes. Fuel combustion. Processing of animal products. Improper disposal of liquid and solid wastes. | Air (local) | Very variable. Odour thresholds range from as low as 1 part in $10^{12}$ parts of air for some compounds. | Odorous substances are often associated with incomplete oxidation of organic substances. Examples of common odorous compounds are: hydrogen sulfide, mercaptants, amines. | Objective evaluation is difficult due to incomplete knowledge of olfactory processes. Annoyance effects may interfere with everyday activities. No effect of odour per se is known to cause specific organic disease. | Marked interference with amenity. | Some odorous substances are highly toxic to man (e.g. $H_2S$) but their toxic effects are not necessarily related to the perceived odours. |
| Mercury (Hg) | Chlor-alkali plants.<br>Mercurial catalysts<br>Pulp and paper industry (slimicides). Seed treatment.<br>Burning of fossil fuels. Mining and refining processes.<br>Medical and research laboratories. | Food, fresh water and marine environment, soil, air (local, regional and global) | a. Air ~0.001-0.050 µg/m$^3$<br>b. Fresh waters ~0.01-0.1 µg/l<br>c. Sea water ~0.1 µg/l<br>d. Food, variable up to 0.05 mg/kg; however some fish from polluted areas may contain up to 1 mg/kg and more | a. Microbial conversion of inorganic Hg and some Hg-containing organic compounds to methyl mercury.<br>b. Build-up in food chains particularly in fresh water and marine organisms. | a. Cumulative poison affecting nervous system (particularly methyl mercury)<br>b. Epidemic outbreak of methyl mercury poisoning following ingestion of polluted shellfish and fish with fatal cases and congenital (fetal) disease (Minamata Disease in Japan) | a. Deaths in birds eating dressed seed (Sweden)<br>b. Possible reproductive failures and population declines in predatory birds.<br>c. Effects on aquatic vertebrates, including fish, and on phyto-plankton poorly understood. | a. Mercury in the ocean is largely of natural origin. Man's activities seem to have contributed only 1/1000 to 1/100 of the total amount.<br>b. Compounds teratogenic in some experimental animals. |
| Lead (Pb) | Anti-knock ingredients of motor fuels.<br>Lead smelting.<br>Chemical industry.<br>Pesticides.<br>Burning of fossil fuels.<br>Lead paints, glazes and enamels. | Air, water and food (local, regional and global) | a. Air - 1.3 µg/m$^3$ in polluted urban areas. In heavy traffic 14-25 µg/m$^3$ .<br>b. Fresh water - up to 0.14 mg/l<br>c. Sea water - 0.01-0.3 µg/l<br>d. Food - generally 0.08 - 0.3 mg/kg. | a. Airborne Pb appears as aerosol, also associated with carbon particles.<br>b. Lead alkyls volatile and fat soluble.<br>c. Build-up in oysters and other shellfish.<br>d. Little known about environmental transformations. | a. Main source of intake is food.<br>b. Affects enzymes and heme synthesis; can affect nervous system.<br>c. Accumulates in bone and kidney with potential long term effects.<br>d. No recorded poisoning from eating aquatic food products. | a. Ecological effects not well understood.<br>b. Stored in marine sediments. | a. Lead poisoning in children from repeated ingestion of lead-containing paint chips from walls in old houses has been observed in USA, UK and elsewhere.<br>b. Suggested ADI[2] for lead is 0.005 mg/kg.<br>c. Tumourigenic to experimental animals, but not to man. |
| Cadmium (Cd) | Mining and metallurgy (lead, copper and zinc smelters).<br>Chemical industry (alkaline accumulators, alloys, paints and plastics)<br>Scrap metal treatment, electroplating.<br>Superphosphate fertilizers. Cd-containing pesticides. | Air, soil water (local) food. | a. Air - urban areas (yearly mean) ~0.02 µg/m$^3$ non-urban ~0.003 µg/m$^3$, industrial up to 0.6 µg/m3<br>b. Fresh water - up to 10 µg/l.<br>c. Sea water ~0.02 ug/l<br>d. Soil - 1-50 mg/kg in polluted rice fields (Japan)<br>e. Food - generally below 0.05 mg/kg (milk 0.1-0.4, oysters up to 8, rice 0.1-1) | a. Known to accumulate in certain marine animals.<br>b. Little known about environmental transformations. | a. Main intake from food<br>b. Possible association with the "itai-itai" disease in Japan (damage of kidney and skeletal system)<br>c. Possible etiological factor in cardio-vascular disease. | a. Lethal for fish at fractions of a ppm.<br>b. Little known about other ecological effects. | a. Compounds teratogenic in some experimental animals. No data available for man. |

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|---|---|---|---|---|---|---|---|
| Phosphates | Sewage.<br>Agricultural run-off.<br>Detergent "builders" | Fresh water and marine environment (local, regional) | Fresh waters - 0.3-1 mg/l (as P) | | No recorded effects at environmental levels. | In excessive amounts considered a major factor in the process of eutrophication resulting in excessive growth of aquatic plants, depletion of oxygen, loss of fish and general degradation of water quality. | a. Essential nutrients for plants and normal constituents of man's and animal's food.<br>b. Eutrofication is a natural process accelerated by man's activities. |
| Nitrates and nitrites | Sewage.<br>Fossil fuel burning.<br>Nitrate fertilizers.<br>Industry. | Fresh water and marine environment, food (local and regional) | a. Fresh water - usually less than 5 mg/l but occasionally in excess of 100 mg/l.<br>b. Food - very variable up to a few thousand ppm in some vegetables; in smoked meat up to 300-900 mg/kg (as $NO_3$) Concentrations of nitrites much smaller. | Nitrates reduced to nitrites and ammonia by intestinal microflora; nitrites are essential precursors in the synthesis of nitrosamines. | Nitrites in food and water may cause infantile methaemoglobinaemia. | In excessive amounts considered a major factor in the process of eutrophication of waters. | Nitrates are essential plant nutrients also used as food additives. |
| Alkyl sulfonates (AS) | Detergents in sewage and industrial wastes. | Fresh water and marine environment (local) | In polluted rivers of the order of 0.1-0.5 mg/l (expressed as methylene blue active substances). | Surface active agents, basic components of synthetic detergents. Alkyl benzene sulfonate (ABS) is stable and resistant to biodegradations. Linear alkyl sulfonates (LAS) show much better biodegradability. | Very low toxicity to man. | Discharge of detergent residues containing ABS results in foaming of receiving waters and interference with sewage treatment processes; conversion from "hard" ABS to "soft" detergents (LAS) reduced this problem. | |
| Chlorinated hydrocarbon (organo-chlorine) pesticides | Application in agriculture and public health. Industrial wastes (e.g. pesticide manufacture, wool and carpet manufacture.) | Soil, food, water, including marine environment, air (local, regional, global) | DDT and related compounds[4]:<br>air - 0.1-400 ng/$m^3$ (London 10 ng/$m^3$) surface waters: 0.6-100 ng/l.<br>rain water: 7-70 ng/l<br>soil (arable): 0.1-5 mg/kg.<br>food (whole diet): 0.03 mg/kg<br>birds eggs: 0.15-30 mg/kg. | Include a variety of compounds such as DDT, dieldrin, aldrin, gamma-BHC.<br>a. Biochemical degradation slow for most compounds.<br>b. Soluble in fats<br>c. Biological accumulation in aquatic food chains (concentration factor 100 to several thousand)<br>d. Inducers of microsomal enzyme activity at low levels. | a. Approximate annual intake of general population 10-20 mg DDT mainly from food.<br>b. General population body burden 10-20 mg/kg. Up to 40 times greater body burdens reported in occupationally exposed groups with no detectable adverse effect to individuals.* | a. Very toxic to crustaceans at extremely low concentration.<br>b. Progressive accumulation in fish can cause disturbances in behaviour and failure of their embryos to hatch.<br>c. DDT regarded as a significant hazard to some predatory birds which can accumulate residues to high concentrations (inability of eggs to hatch - thinning of egg shell). | ADI[3] values (mg/kg):<br>DDT - 0.005<br>Heptachlor - 0.0005<br>Aldrin - 0.0001<br>Dieldrin - 0.0001 |

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|---|---|---|---|---|---|---|---|
| Poly-chlorinated biphenyls (PCB) | Electrical industry; plastics industry, lubricants, industrial effluents and sewage, uncontrolled disposal (including incineration) of PCB containing products. | Water, including marine environment (local, regional and global) | Generally ppb range. Much higher levels (of the order of 10-100 ppm and more) found in tissues of some fish, seals and birds. | a. A large number of isomers, generally behave similarly to chlorinated hydrocarbon (organo chlorine) insecticides, resistant to oxidation and hydrolysis.<br>b. Enzyme inducers at very low concentrations. | a. No known ill effects on man associated with exposure to PCB's at levels now found in the environment.<br>b. Heavy and prolonged (occupational) exposure may produce skin lesions and liver damage.<br>c. Possible association with mass poisoning in Japan (ingestion of rice oil contaminated with PCB's). | a. Although fairly high levels reported in shellfish and fish, no damage to marine life observed.<br>b. High concentrations in liver of some birds. Possible cause of excessive deaths. Appear to disrupt the pattern of normal breeding behaviour and cause thin-shelled eggs.<br>c. Other ecological effects not well understood. | a. Widespread environmental pollution by PCB's appreciated only recently because of difficulties in detection and analysis |
| Asbestos | Mining operations, fibre production from the ore. Manufacture of brake linings and insulated pipes (asbestos-cement industry). Abrasion of brake linings in motor vehicles. Asbestos lined water pipes, asbestos filters. | Air and water (local, but widespread) | Estimated concentration in the vicinity of heavily travelled streets, 600-6000 particles/$m^3$; 3000-34000 μg/$m^3$ in the air near asbestos manufacturing plants. Airborne asbestos detected up to 80 km from industrial sources. Most natural waters contain traces of asbestos. | a. Asbestos is a broad term embracing several fibrous minerals. Chrysotile, a hydrated magnesium silicate, is the most common form of asbestos. | a. A possible factor in the incidence of lung disease along with other air pollutants and smoking.<br>b. Heavy and long exposure (occupational) may cause specific chronic lung disease.<br>c. Inhalation of asbestos has also been associated with mesotheliomas (a rare form of cancer). | a. Animal asbestosis recorded but rare.<br>b. No reported effects on plants. | |
| Mycotoxins | Prepared food for man and feed for animals | Peanuts, beans and corn are principal food products contaminated with aflatoxins. | Aflatoxins: 0.1-1 ppm found in about 50% of food samples in Uganda and Thailand. | Aflatoxins are metabolic products of Aspergillus flavus. Chemical structure identified (e.g. aflatoxin $B_1$, $B_2$, $G_1$, $G_2$). Mycotoxins are produced also by other moulds (e.g. Pencillium islandicum). | Suspect to produce liver injury and cancer. | Known to kill ducks, turkeys and fish. | Very toxic but can be chemically monitored and controlled. |
| Polycyclic aromatic hydro-carbons (PAH) | Combustion of organic materials. Exhausts from gasoline and diesel engines. Atmospheric soot, cigarette smoke. Wastes from gas-works, refineries, chemical industry. | Air, water, food (local and regional) | Information incomplete. Data below refer mainly to benzo (a) pyrene.<br>Air: 0.01-100 μg/1000$m^3$ (large local and seasonal variations).<br>Surface water: 0.03-0.1 μg/l.<br>Marine plankton: up to 400 μg/kg.<br>Soil: 0-400 μg/kg<br>Smoked meat and fish: up to 50 μg/kg.<br>Cigarette smoke: about 15 μg/1000 cigarettes. | Include a variety of chemical compounds such as benzo (a) pyrene (BP), dibenzo (a,i) pyrene, dibenzo (a,h) acridine. | The evidence that occupational exposure to mixtures of PAH (coal tar, petroleum products) causes cancer in man is conclusive. However the role of individual chemical compounds is not clear. For other types of environmental exposure, evidence is suggestive but not conclusive. | Information not available | |

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|---|---|---|---|---|---|---|---|
| Oil | Shipping accidents<br>Run-off from transport wastes<br>Polluted land drainage<br>Refineries<br>Offshore oil production | Fresh water, sea and land (local and regional) | Not applicable | Complex mixture of hydrocarbons. Forms surface films on water. In temperate and tropical zones biodegradable and oxidized under the action of light. | No direct effects observed from environmental exposure other than occupational. | a. Oil films greatly reduce uptake of oxygen by water.<br>b. May cause mass death of sea birds.<br>c. Generally low toxicity to marine life (not nearly as toxic as detergents used to disperse oil spillage). In estuaries and bays more toxic fractions together with oxygen depletion may produce more marked mortality of some species. | |
| Degradable organic matter | Sewage<br>Garbage<br>Industrial wastes<br>Agricultural wastes | Fresh water and marine environment, land and soil (local) | In terms of biochemical oxygen demand (BOD) levels range from 1 mg/l in natural waters to 300-500 mg/l in untreated domestic sewage. | A complex mixture of carbohydrates, proteins, fats and oils, and other organic compounds. | No direct effect *per se*. Degradable organic matter in sewage may be associated with pathogenic organisms such as causative agents of water-borne diseases. | Major pollutant of fresh water bodies and coastal waters. Consumes dissolved oxygen. If present in excessive amounts damages aquatic life by oxygen depletion. High nutrient content may contribute to the process of eutrophication. May cause serious amenity problem affecting recreational uses of water. | |
| Solid wastes | Domestic, municipal, commercial, industrial and agricultural activities;<br>Urban solid waste production approximately 500 kg *per capita* annually. | Land, fresh water and marine environment (local) | Not applicable | Contain degradable organic matter, paper, cardboard, metals, plastics, glass, etc. Industrial refuse may contain highly toxic materials. | Provides favourable conditions for infestation with rodents and flies and other disease vectors. | A major pollution problem with significant economic implications. Soil pollution and land degradation. Water pollution from dumping and run-off. Some disposal practices such as incineration cause local air pollution problems. | |
| Pathogenic organisms | Human and animal excreta (sewage, agricultural run-off etc.)<br>Contaminated food and water. | Fresh water and marine environment, soil, (air) | Not applicable | Include a large variety of pathogenic bacteria, viruses and parasites responsible for food and water-borne diseases and diseases transmitted through soil contact | Transmission of communicable diseases such as cholera, bacillary dysentery, typhoid fever, bacterial food poisoning, amoebic dysentery, infective hepatitis.<br>Major problem in a large part of the world. | May be responsible for diseases in livestock and wild life. | |

| POLLUTANT | PRINCIPAL MAN-MADE SOURCES | DISTRIBUTION IN THE ENVIRONMENT | APPROXIMATE LEVELS | RELEVANT CHEMISTRY AND ENVIRONMENTAL INTERACTIONS | EFFECTS ON MAN'S HEALTH | EFFECTS ON THE ENVIRONMENT | REMARKS |
|---|---|---|---|---|---|---|---|
| Ionizing radiation (including radio-nuclides) | Medical uses.<br>Weapon production and testing.<br>Nuclear power production.<br>Uses of radio-isotopes and radiation sources in industry and research. | Air, fresh water and marine environment, land and soil. (Local, regional and global) | Genetic doses:<br>Natural sources - 100 mrad/year.<br>Medical applications - 6-60 mrad/year.<br>Weapons testing: total doses to be received in the northern temperate zone by year 2000 - 110 mrads.<br>Nuclear power production: current world-wide doses much smaller than 1 mrad/year. | Behaviour in the environment depends on chemical properties of radionuclides. Some can be strongly concentrated in aquatic food chains depending upon the organism and nuclide species. | Acute somatic effects occur at doses above 100 rads.<br>Long-term somatic effects (essentially induction of malignancies) believed to occur with frequency directly related to dose even at the lowest doses.<br>Genetic effects are induced with frequency directly related to dose even at the lowest doses and may manifest themselves in the descendants of irradiated people, sometimes generations later. | No effects on the environment have been reported at current levels of contamination. | Radiation protection standards designed to protect human health have been accepted internationally. |
| Non-ionizing radiation | A variety of electronic devices such as microwave ovens, lasers, medical diathermy equipment, high power radio and radar transmitters. | Not applicable | Information inadequate | Non-ionizing portion of the electromagnetic spectrum covers at least 12 decades of energy and includes entirely different phenomena, interactions and biological effects from the ionizing region. | Microwaves: Lens of the eye is the critical target organ at about 3000 MHz (range of frequencies more commonly used in industrial, domestic and telecommunications applications).<br>Lasers: Critical organs - eye and skin. Levels producing visible lesions depend on type of laser and are of the order of 0.1-1 joule/cm$^2$ for the eye. Little known about possible cumulative effects of low level exposure. | Information not available. | |
| Heat | Fossil-fuelled and nuclear power stations.<br>Large urban areas. | Water, air (local) | a. "Thermal pollution" may locally increase the temperature of streams and lakes several degrees C.<br>b. Cities may have a temperature 0.5-0.9°C higher than the surrounding countryside. Effect is more marked in winter months. | Increase of temperature in water increases reaction rate of chemical and biochemical process. | No direct effects related to thermal pollution of water. | Thermal pollution of water increases metabolic activity of aquatic organisms and may render estuaries and other waterways unsuitable for commercial species of fish and shellfish.<br>b. "Thermal mountain effect" in cities (which raises the air to colder levels) aids the precipitation process. | At the present stage of technology nuclear power stations cause up to 50% more thermal water pollution than fossil fuelled stations per unit of power. |

| POLLUTANT | PRINCIPAL MAN-MADE SOURCES | DISTRIBUTION IN THE ENVIRONMENT | APPROXIMATE LEVELS | RELEVANT CHEMISTRY AND ENVIRONMENTAL INTERACTIONS | EFFECTS ON MAN'S HEALTH | EFFECTS ON THE ENVIRONMENT | REMARKS |
|---|---|---|---|---|---|---|---|
| Noise | Transportation - especially aircraft and motor vehicles.<br>Industry<br>Building construction<br>Occupational and domestic sources | Air (local) | Typical urban background 68-80 decibels by day and 50-70 decibels by night | - | a. Subjective effects include annoyance, interference with speech, sleep, learning and task performance<br>b. Objective effects may be immediate (e.g. temporary learning threshold shift) or cumulative (e.g. sustained sleep interference). Very long exposure may cause premature age-induced hearing loss.<br>c. Knowledge of effects at low exposure inadequate. | May affect domestic animals and livestock similarly to man. | |

1. ppm (parts per million by volume) multiplied by $\frac{\text{molecular weight} \times 10^6}{22400}$ yields micrograms of substance per cubic metre ($\mu g/m^3$) of air at standard conditions.

2. ADI (acceptable daily intake) of a substance is defined as "the daily intake which, during an entire lifetime, appears to be without appreciable risk on the basis of all the known facts at the time" (FAO Agriculture Series, 1970, No.84, p.39; World Health Organization techn. Rep. Ser., 1970, 458 p.39). It is expressed in milligrams of the chemical per kilogram of body weight (mg/kg). ADI for lead: World Health Organization techn. Rep. Ser. 1967, 373.

3. World Health Organization techn. Rep. Ser. 1970, 458, gives ADI value for a number of other pesticides.

4. 1 nanogram (ng) = $10^{-9}$ gram.

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* "Although there is definite evidence that, in mice, DDT in large doses increased the incidence of hepatomas, the significance of this finding in relation to man cannot be assessed as yet. In view of this, and in the light of the evidence available on the health of the individuals most heavily exposed to DDT, there is at present no sound reason to believe that the millions of people protected against vector-borne diseases are at tangible risk from their small exposure to DDT."
(WHO (1971) Off.Rec. No. 190, p.178.)

# CHAPTER IV

# MAJOR POLLUTION PROBLEMS

## A. The atmosphere

32. Every year millions of tons of gaseous and particulate pollutants are injected into the atmosphere both through natural processes and as the direct result of human activity. Scientists have pointed out however that the Earth's atmosphere cannot absorb unlimited amounts of pollutant materials without undergoing changes which may be of an adverse nature with respect to human welfare. Consider, for instance, the following table which illustrates the rate at which some pollutant materials are released into the atmosphere and the portion which is attributed to some form of human activity.

| Constituent | Estimated annual global production from natural and human activity | Portion attributable to some form of human activity |
|---|---|---|
| $CO_2$ | $8.5 \times 10^{10}$ metric tons | 20% due to human activity |
| CO | $2.0 \times 10^{8}$ metric tons | 60% from automobiles |
| $SO_2$ | $1.5 \times 10^{8}$ metric tons | 70% from combustion of coal |
| $NO_x$ | $1.2 \times 10^{9}$ metric tons | 5% industrial |
| dust, smoke | $2.5 \times 10^{9}$ metric tons | 20% due to human activity |

33. Other common atmospheric pollutants in industrial countries are lead and oxidants, including ozone. Radioactive isotopes are injected into the atmosphere by various activities. Those that contribute most are nuclear weapons tests. A return to the rate of testing experienced in the early 1960's would make this kind of pollution a major threat. The reprocessing of spent nuclear fuel from nuclear power plants is currently the main source of radio-active discharges to the environment from peaceful uses of radioactivity but while the attendant doses to the world population are much lower than those received from nuclear weapons tests, fission byproducts, their transport and disposal, will cause increasing concern in the near future.

### (i) The problem of air pollution

34. In some cases, pollutants released to the atmosphere are removed quickly by fallout or washed out by precipitation or they may be confined and concentrated in a relatively local area by a combination of meteorological and topographical conditions

which prevent effective dispersion. In these cases it is the local area which is affected, sometimes seriously. In other cases the pollutant may be transported over great distances and affect areas hundreds of kilometers away. Many cases of such transport have been documented, for example: dust picked up by wind storms over North Africa falling over Europe, smoke from forest fires in North America being visible in Europe and products of industrial processes on the east coast of North America being detected at a distance of 300 kilometers over the Atlantic Ocean. In other situations the pollutant may not be removed from the atmosphere and may be entrained in global circulations and reside there for periods of months or even years. Carbon dioxide is such a constituent as is water vapour. These two elements are present in detectable amounts even in unpolluted air. Increased concentrations due to combustion of fossil fuel may alter the physical, chemical and radiative properties of the atmosphere in a manner which could have adverse effects on human life on earth or could induce a change in the global climate.

### (ii) Local pollution and its effects

35. Toxic substances such as compounds of lead, some compounds of mercury and carbon monoxide have direct and immediate effects on human health. They are encountered locally close to industrial sites in the midst of congested city traffic. (They may also pose serious control problems in confined occupational environments. This problem, which is being actively studied by ILO and WHO, falls outside the scope of the Conference).

36. Other compounds such as sulphur dioxide, oxides of nitrogen, ozone, etc, may affect larger areas. Although present in lower concentrations they nevertheless, in time, affect human health. Long-term exposure to polluted air has been shown to increase the incidence of chronic diseases of the respiratory tract.

37. Meteorological conditions may act to concentrate air pollution to produce abnormally severe "smog" such as that which was experienced in London in 1952, when about 4,000 deaths occurred in excess of the number normally expected. In other parts of the world a combination of meteorological and topographical conditions can concentrate chemical pollutants, such as oxides of nitrogen and certain hydrocarbons which may undergo photochemical change producing the strong irritant, ozone.

38. Severe local pollution can also affect plants, animals and property. Sulphur dioxide concentrations typical of many urban environments can reduce plant growth rates, and higher concentrations have depleted some forests in several countries of

Europe. Many pollutants can reduce the yield and quality of crops grown near the source of pollution; for example, certain types of agriculture cannot be conducted near aluminium plants in a number of places in the world. Some stone buildings are particularly vulnerable to erosion and disfiguring by certain sulphur compounds dissolved in precipitation. Unprotected iron structures are likewise affected.[1]

### (iii) Regional pollution

39. Air pollution is increasingly a regional problem, no longer confined to cities. Many large cities, for example, have recently managed through pollution control measures to reduce the total amount of suspended particulate matter in the air, but in at least one country, the concentration at certain non-urban measuring stations has been rising. Evidence indicates that certain urban pollutants can damage agricultural products and vegetation at considerable distances from cities.

40. Pollutants also interact on a regional scale. The interaction can range from the simple additive effect of successive emissions into the air crossing a region to more complex chemical and photochemical changes that occur as pollutants are inter-mixed by atmospheric diffusion.

41. Pollutants may affect regional weather and climate by attenuating solar radiation and altering normal precipitation processes. Some scientists think that pollution-produced nucleating agents - particles around which water tends to condense - increase precipitation at least within large conurbations.

### (iv) The effects of global pollution on climate

42. Climate - the long-term sum of weather conditions - is determined by a balance among a large number of interacting physical processes in the atmosphere and oceans and at the surface of the land and oceans. Changes in reflectivity of the Earth's surface due to major changes in land use; large injections of heat into the atmosphere and the oceans as will inevitably accompany the expected increase in energy production (the heat dissipated in the processes of energy generation and consumption is already being felt in areas such as the Northeast section of the United States); changes in the composition of the atmosphere, by altering the heat budget of the Earth, may jointly cause climatic changes of a magnitude and direction that we are unable to assess.

43. Thus, the Earth's temperature may rise as a result of the increased atmospheric content in carbon dioxide due to future consumption of fossil fuel. While a 2°C increase of the average annual temperature at the surface of the earth would, over a

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[1] Cost figures of corrosion damage and corrosion protection in Sweden are presented in Sweden's case study for the Conference "air pollution across national boundaries: The impact on the environment of sulphur in air and precipitation", pp 72 and 73.

period of centuries, bring about a melting of the polar ice caps and thus a rise of the sea level with corresponding reduction of the surface of the continents, we are still unable to determine quantitatively the effect of the predicted increase of atmospheric carbon dioxide on the earth temperature. On the other hand, increased turbidity of the atmosphere due to a combination of natural events (volcanic eruptions) and human activities (e.g. forest fires and incomplete burning of fossil fuels), by preventing radiation from reaching the Earth's surface, would bring about a cooling of the Earth and an expansion of the glacial cover.

44. What needs to be clearly understood is that cooling and warming up of the earth have been experienced several times over geologic times and can be expected to occur again as a result of natural causes within times that we cannot determine. However, we now realize that man's activities may also add a powerful destabilizing factor to the interplay of the natural forces that determine the climate.

### (v) Prevention and control

45. The effects of atmospheric pollution control are now becoming apparent, especially in certain large cities, where acute pollution has already declined. Better planning and regulation of road transport can further improve the immediate health situation in urban areas, but does not necessarily reduce the total emission of pollutants to the atmosphere. This, however, can be achieved through the improvement and encouragement of mass transit systems. Even more may be gained by altering the internal combustion engine, by use of leadless fuels, (provided this does not result in increased polycyclic hydrocarbon emission) and by possible development of substitutes for the internal combustion engine.

46. Pollution due to energy production and use, and industrial operations can be reduced in four main ways:

- through improved methods of desulphurization of fuels and combustion gases;
- by reduction of the particulate matter emitted by thermal power plants and during mineral processing and mining operations;
- through the use of nuclear fission reactors. While the operation of such reactors poses environmental problems of a different nature, the associated hazards either have been or can be reduced to very satisfactory levels. Further advances may be realized if controlled nuclear fusion is achieved;
- through improved efficiency of every form of energy use, by which the total demands for energy may be restrained without significant effect on living standards.

47. In the more distant future, the development of alternate sources of power, such as geothermal energy, the harnessing of tidal power and solar radiation, may make further advances possible, as might the fuller development of the fuel cell.

### (vi) Research requirements

48. There are large gaps in our understanding of air pollution. Far too little is still known about the effects of air pollution on people; even where the acute effects are well established, there is doubt about the effect of long-term exposures to low doses. Broad epidemiological studies on both urban and rural populations are required in this field and should be linked to animal studies. Better data, acquired through monitoring systems using existing techniques, are needed for such studies and as a basis for local and regional control measures.

49. The consequences of certain human activities on the global climate could be so serious, and so little quantitative knowledge about them is available, that man should engage in activities that can have such consequences with utmost caution and restraint, keeping under careful review their effects to ensure that corrective action can be taken before irreversible damage is caused. In this connexion concern has been voiced about such activities as:

- large-scale experiments (those directly affecting areas of more than a million $Km^2$) in climate modification;
- large-scale modifications of land use, including de-forestation;
- large-scale operation of supersonic aircraft in the stratosphere.

## B. The seas[1]

50. The seas cover two thirds of the world's surface, and their interface with the atmosphere (across which exchange of energy and matter takes place) is thus correspondingly larger than the land /atmosphere interface. The biological productivity per unit of surface of the more fertile parts of the sea is greater than that of much agricultural land. Yet the seas are the sink of the world, where natural run-off from the land masses - including man's pollutants - accumulates, together with pollutants resulting from atmospheric fall-out.

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[1] See "The sea: prevention and control of marine pollution", report of the Secretary General to the fifty-first session of the Economic and Social Council (E/5003).

### (i) The problem of marine pollution

51. The estuaries and inshore waters, which include many of the most productive areas of the sea, are also those very places where most solid and liquid pollutants end up. Past levels of pollutants were often low enough for natural processes to render them harmless. Now, however, the levels of many pollutants are rising very rapidly and there are signs that we need to decrease the release of certain pollutants.

52. Biological factors have especially to be borne in mind when considering marine pollution. Many marine organisms concentrate persistent contaminants, and may therefore accumulate amounts harmful to themselves or to creatures higher up the food chain. This can happen even when the levels of such contaminants in the oceans themselves are so low as to escape detection.

### (ii) Sources of marine pollution

53. The sea receives pollutants directly from coastal discharges, from estuaries and rivers and from the air, as well as from ships and from the exploitation of sea-bed mineral resources. Rivers are the principal route by which most pollutants reach the seas, but fall-out from the atmosphere is also responsible for certain major inputs. For example, two important pollutants, lead and DDT, are considered to be contributed in roughly equal proportions by river discharges and fall-out from the atmosphere.

54. Pollutants become dispersed in some areas and concentrated in others by ocean currents, tidal movements and winds acting on the surface of the sea. (Although oil pollution from ships mainly originates in the narrow shipping lanes, oil has become one of the most widely spread of all contaminants and is now found in remote parts of the oceans far from shipping routes.) There are very wide gaps in our knowledge of detailed water movements and dispersal, both coastal and in the deep parts of the sea. This,combined with insufficient information on accumulation and concentration in marine biological systems, makes predictions about the likely effects of contaminants on the physical, chemical and biological characteristics of the sea difficult.

55. The principal direct hazard to human health from marine pollution is through consuming fish or shellfish that have accumulated toxic materials; shellfish in particular may also pick up and concentrate bacteria and viruses from sewage in estuaries and closed inshore waters. The major effect of marine pollution, on man may, however, be indirect - through reduction of his food supply. Pollutants that may affect the supply and quality of food from the seas include the following:

- organochlorine pesticides and PCBs, known to have accumulated in some seafood resources and to have caused declines in seabird populations;[1]
- certain heavy metal compounds are highly toxic to human beings. In the United States, shellfish beds have been closed and fish rendered unfit for human consumption because of these materials;
- solid from dredging, mineral extraction and numerous industrial processes affect bottom-living organisms and also interfere with the migration of fish. The increasing debris of virtually indestructible modern plastics provides a growing hazard to commercial fishing operations as well as to shipping.

56. Oil is a growing hazard, although at present its effects appear to be on seaside amenities rather than on marine life itself. The influx of oil and oil products into the seas is a matter of study for which no precise figures are available. Estimates range between five and one hundred million metric tons per year. Approximately 2.1 million metric tons are believed to be introduced by normal shipping operations, accidents, dumping at sea, offshore operations and sewerage, including river outflow. Additionally, some 90 million tons of petroleum products are vaporized, of which a significant portion settles in the seas.[2] The quantities of oil from both maritime and land-based activities are likely to increase. Oil is particularly hazardous in polar regions since bacterial oxidation, the natural means of oil degradation, is very slow at lower temperatures; oil spilled in the Arctic may last for 50 years.

57. Thermal pollution, mainly by hot-water discharges from industrial processing and power plants, is already evident in certain inshore waters and estuaries. Heating-up of certain waters accelerates eutrophication, the effects of which are described below in the section dealing with fresh water.

58. The list given above suggests that marine pollution is already serious and may threaten the usefulness of fish as a major source of protein for man - a source that is becoming increasingly important as world population rises. Other factors, especially over-exploitation, have probably affected fish catches more, but there is little doubt that marine pollution can be a threat as well.

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[1] See "Control of polychorinated biphenyl compounds in the United Kingdom" submitted, by the United Kingdom to OECD.

[2] See E/5003, para. 63, and Man's Impact on the Global Environment, MIT Press, 1970, pp. 140 and 267.

(iii) Prevention and control

59. Efforts to control marine pollution cannot await the results of complex ecological research, for there is much that needs to be done quickly if irreparable damage to human health and marine resources is to be averted. This applies especially to the threats posed by the toxic metals, by organochlorine pesticides and PCBs and by oil. Geographically, the danger is most evident in estuaries, coastal areas, and enclosed or nearly enclosed seas, but even in the open ocean pollution is a matter of growing concern.

60. The practicability of control measures should not be confused with their effectiveness in solving the overall problem of marine pollution. While the dumping of chemicals at sea can and should be controlled, it must be recognized that this is a far less important source of marine pollution than are the effluents discharged by rivers or industrial outfalls. Until these latter discharges are effectively controlled, marine pollution will continue to be a very serious problem.

61. Quantities of pollutants reaching the seas via the atmosphere are important as well, particularly those of persistent pesticides, PCBs and lead from gasoline. Reduction of these depends to a large extent on the use of alternative substances and on improved technology.

62. The capacity of the oceans to absorb pollutants is limited. For this reason, the development of a comprehensive approach to the protection of the ocean against pollution and to the better management of the marine resources is a matter of growing international concern. International co-operation is essential for the control of marine pollution. A first requirement is for regional agreements among nations that border particularly threatened bodies of water, such as the Mediterranean, Baltic, Black and Caspian Seas. Another urgent requirement is an international referral system to facilitate the exchange of information on control measures and research undertaken by governments.

63. There are still many gaps in our knowledge of the biological processes that take place in the oceans, and hence, of the fate of pollutants entering them from the atmosphere or from the land. Recommendations concerned with filling the more important of these gaps are included in subsequent chapters, VIII and IX.

## C. Fresh water

64. The need to ensure adequate fresh water supplies to an expanding population and to increasing industry and agriculture raises national problems now common to almost all nations. It also gives rise to international problems, such as when river basins are shared among neighbouring nations. Water pollution adds a new and growing dimension to the complexity of these problems by magnifying the stress that competing demands place on water resources.

### (i) The problem of fresh-water pollution

65. Biological pollutants (bacteria and other micro-organisms) now constitute the major water hazard in developing countries but in the industrialized countries, chemical pollution is the major, and increasing, hazard wherever industry and technology penetrate.

66. Fresh-water pollution can affect man both directly and indirectly.

67. Direct hazards to human health are mainly due to the transmission of disease organisms or harmful chemicals in drinking water. The mortality rate among people suffering from water-borne diseases is high, and the great increase of large migrant populations outside many cities poses particularly dangerous problems in this respect. While the mortality rate from chemical pollution of water is low at present, there is concern about possible sub-acute, long-term carcinogenic and mutagenic effects of some chemical pollutants, including the organochlorine pesticides, PCBs and polycyclic aromatic hydrocarbons. The basis for this concern will increase as a larger proportion of drinking water is obtained from recycled river water, which can be made pure biologically more readily than it can be rid of trace amounts of some chemicals.

68. Fresh-water pollution indirectly affects man primarily through reducing supplies of drinking water and food. The pollutants mentioned in the section on marine pollution are generally present in much greater concentrations in fresh water and they fluctuate more than in the sea. For these reasons and because fresh-water habitats (especially ponds, lakes and small rivers) are restricted and often isolated, the organisms living in them are under much greater threat than is marine life. The threat to fresh-water fish resources will loom larger as the need for these resources increases with rising population pressure, especially in land-locked countries.

69. Recognized threats to the food supply today include:

- eutrophication by nutrients. A classic and well documented case is that of Lake Erie on the United States-Canadian border, where pollution has contributed to radical changes in the fauna, reducing the value of fish production markedly and even exterminating life in parts of the lake. Run-off containing excess fertilizer from agricultural areas is also causing concern in many parts of the world;

- pollution by toxic metals, organochlorine pesticides and PCBs. Very few studies have been made of the effects of pollutants on fresh-water organisms, and so conclusions cannot be drawn about their broad consequences for populations of fresh-water fish and other aquatic fauna. However, the evidence suggests that many invertebrates, fish and water-fowl may be at risk from these pollutants;
- pollution by organic matter. Waste from food-processing and other agro-industrial processing decays in the water, reducing the oxygen supply and thereby the aquatic fauna.

70. Another indirect effect is on environmental amenities and recreation. Throughout the world both natural and man-made waters are used increasingly for recreation - fishing, boating and swimming. Pollution reduces the aesthetic value of fresh-water bodies by assaulting the eye and nose and by reducing populations of game, fish and of wildlife.

### (ii) Prevention and control

71. The industrialized countries, in general, avoid the hazards of biological pollution by piping clean water from unpolluted areas or by using treated river water. As their populations and industries increase, however, these sources will not suffice, and recycling will need to be increasingly adopted. Whether river water is used directly or indirectly (by replenishing groundwater supplies at times of excess flow) there will need to be very careful pollution control.

72. By studying the industrialized countries' experience, developing countries should be able to avoid many of these problems, and by preventing pollution from arising, greatly reduce the cost of clean water supplies to large cities.[1] In general, it is obviously preferable, and in the long run, cheaper, to prevent water from becoming polluted than to clean it up afterwards, and this applies, of course, to industrialized as well as to developing countries. Means of prevention include:

- the siting of industry and of effluent outlets in such a way that effluents do not overload the biological capacity of the waters into which they are discharged;

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[1] See in this connexion, Mercury Crisis in Canada, Canada's case study for the the Conference.

- not allowing compounds that accumulate in food chains, or degrade very slowly, to enter water courses in significant amounts. Such compounds (see Table I above) should be extracted for re-use or other treatment before the effluent is discharged;
- by recycling process water within the factory or other source, and reducing the quantity and increasing the purity of the effluent.

73. On the control side, complex treatment systems involving physical, chemical and biological processes have been evolved in many countries, yet in many others there is virtually no treating of either domestic or industrial wastes. In such countries, the first requirement is for cities and industrial plants that now discharge raw sewage and effluents to build treatment works. It is also essential to arrange for the disposal of solids extracted from sewage or effluent, in such a way that they do not add to pollution elsewhere. This is a difficult problem, since incineration may merely turn water pollution into air pollution, and burial of such materials may lead to groundwater pollution problems elsewhere. Recycling of such solid wastes back into their component elements (or into other useful compounds) would appear to be the most hopeful - albeit long-term - solution.

(iii) Research requirements

74. The new knowledge needed in the area of fresh-water pollution to some extent parallels the need with regard to the oceans, especially as regards the effects of pollutants on fresh-water organisms and the flow of pollutants through ecosystems. As with marine pollution, the salient research requirements are dealt with in subsequent chapters of this paper. It will also be apparent from the previous paragraph that much work needs to be done on the disposal of highly toxic materials in fresh waters. The particular vulnerability of ground water to pollution given its low self-cleansing capacity and the difficulty of cleaning up polluted ground water suggest that special efforts should also be made in this area.

75. As with other pollution problems, there is an urgent need for international co-operation, again in fields already discussed under previous sections. Joint planning and management can be applied to river basins and to rivers shared by several countries, and can lead to joint water-quality management agencies and international water-quality conventions.

## D. Food

76. Food is the principal route whereby most contaminants enter the human body. In many instances it may also serve as a useful indicator of the quality of the environment in which it is produced.

77. Man has always risked harm from contamination or naturally occurring toxic substances in some foods. Expanded trade and the acceleration and centralization of food production and processing have speeded up the spread of contaminants and of food affected by them and have increased the amounts of food exposed to contamination. Heavy metals and other chemicals, persistent pesticides, micro-organisms and certain radioactive materials (particularly those released by nuclear weapons tests) have now a world-wide distribution and may pose hazards far from the area of release. Unless the sources of pollution are adequately controlled, expected increases in industrial output and indiscriminant use of pesticides will add to these threats to health, natural resources and food supplies. The increasing exportation of processed food to developing countries may present new hazards to peoples who have learned to cope with indigenous pollution problems but not with problems associated with imported food contamination.

### (i) The problem of food contamination

78. Food, unless well protected, is liable to biological, chemical, or radiological contamination at every stage from growing to final consumption. Both while growing and during processing and marketing, foods may become contaminated with micro-organisms capable of producing human illness or spoilage of food. New animal diseases or previously unsuspected animal-human disease links are being reported.

79. Since World War II, new pesticides have been synthesized and widely used; the use of antibiotics and other new veterinary drugs has become common and industrial synthesis of new chemicals has increased manifold. These developments have increased the environmental contamination to which foodstuffs are inevitably exposed. Contamination by pesticide residues may result directly from (1) improper or careless application to growing crops, (2) excessive post-harvest applications, (3) excessive combined pre- and post-harvest use, and (4) accidental contamination during shipment or storage. Contamination by pesticide residues or heavy metals concentrated through aquatic food chains have already been referred to in the relevant section above.

80. In recent years there has been a great increase in the number and quantity of chemical additives used in food for various purposes. This practice may result in contamination by unsafe residues through the excessive, accidental or unintentional use of additives or through failure to remove additives intended solely as processing aids.

81. Residues of antibiotics, and many other drugs used for veterinary purposes or to promote growth of livestock may appear in meat, milk, or other animal foods unless the use of the drug is discontinued long enough before the animal is killed.

82. Radio-active contamination has most commonly been the result of fall-out from atmospheric nuclear tests and, to a lesser extent, of discharges from nuclear facilities.

(ii) Prevention and control

83. When establishing policies concerning industrial and agricultural development, governments will sometimes have to weigh economic or social benefits against potential risks to safety, consumer protection or the environment. A nation lacking any other means of supplying milk to its infants might accept the use of a preservative that in most other countries would be unacceptable. If supplies of staple food are threatened in a food-deficient area, certain actions (such as in the chemical control of pests) might be justified that are not normally acceptable, as long as the resulting levels pose no immediate risk.

84. Increased food production will continue to depend, to some extent, on increased use of chemicals. Fertilizers are needed to increase crop yields. Seeds must be protected with fungicides. Insecticides, fungicides and herbicides may be needed to protect growing crops. Antibiotics and other veterinary drugs will be needed to protect animals against disease and to promote growth. In each instance the need to protect human food must be weighed against the risk of chemical contamination. Similar judgements must be made regarding all types of pesticides and preservatives (including irradiation) needed to reduce the tremendous waste of foods during storage.

85. In addition to the general legislation for control of sewage and industrial wastes, specific legislation is needed to prevent the contamination of foodstuffs. Although nearly every nation has basic laws that make some provision for food control at the national or local level, many of these need to be revised and up-dated in line with technological advance in the manufacture, preservation, processing, transportation and marketing of foodstuffs and the special needs of preventing and controlling food contamination.

86. Where such legislation does not exist, it should be formulated and implemented as soon as possible. Particular points to be considered in guarding against food contamination are: regulating use of pesticides and of food additives, and setting tolerances for their residues; the provision of sanitary conditions throughout the food processing industry; and the establishment of national food standards; controlling labelling; and generally strengthening the food control system.

## Chapter V

## CONSIDERATIONS FOR NATIONAL ACTION

87. Actions to control pollution have been taken for a long time by many countries in such areas as water and sewage treatment and food contamination. As the preceding discussion has brought out, however, nations are now faced with greatly increased needs for pollution control activities in these and in many additional areas. Experience in meeting these needs is limited, and governmental actions are still largely in the formative and preliminary stage. The Conference preparations themselves have generated major discussions of the problems involved, and have contributed to the advancement of policy formulation. What follows does not purport to be a comprehensive description of these experiences. The object is rather to identify some major issues which are already apparent and on which work needs to be continued.

88. There are as yet few, if any, rules to guide pollution control actions of governments in all cases. One country's successful experiences may or may not provide useful guidelines for another country. Differences in levels of development and differences in socio-economic systems will be particularly important in determining appropriate actions. Nevertheless, knowledge of what others are doing and of new ideas being advanced, may be useful stimulants to planning in all countries. This chapter presents some of these activities in a manner which reflects the preliminary stage of their development.

### A. Economic considerations

89. Economic considerations permeate most decisions about pollution control. With the exceptions of the pollution control actions just noted, externalities or social costs of pollution have been largely ignored. But as the levels of contaminants at which undesirable effects occur have been approached or exceeded, and the accompanying social costs have become considerable, needs for pollution control have been recognized. Traditional economics has not always provided means for reducing these social costs, thus creating requirements for government action to set pollution reducing activities in motion.

90. The situations governments have to face in making decisions about pollution control are complex. The decisions themselves involve trade-offs in the allocation of resources, and these are particularly difficult to make in developing countries. Considering alternatives in terms of costs and benefits provides a useful means of weighing the relative merits of allocating the available resources. However, major

problems arise in attempting to incorporate environmental issues into cost-benefit analyses. This is one of the areas to which priority attention should be directed because of its central importance to all aspects of environmental action. Discussions and exchange of information among countries in cost-benefit methodology should be strongly encouraged.

91. The costs of controlling pollution, essential information for decision-makers, are difficult to estimate on a national basis. Each situation varies, and factors in which may not at first be apparent; the scale and relative age of manufacturing plants; the proportion of high-to-low polluting industries in a country and their spatial distribution; the natural capacity of local environments to assimilate effluents; the degree of pollution abatement desired (e.g., removing 99% of a contaminant from an effluent may be twice as costly as removing 90%); and difficulties in placing values on amenities such as freedoms from "excessive" odours or noise. Efforts to estimate these costs would benefit from better collection and exchange of relevant data among governments.

92. Difficult questions also surround the problem of who should pay the costs of pollution control. Some policy-makers in market economies favour payment by the firms or industries causing the pollution. The normal operation of market forces would then tend to transfer some or all of these costs to customers of the enterprises, as in the case of increases in most production costs. Other policy-makers favour distributing pollution control costs to society at large, or to specific groups by such means as incentive payments. In practice, most governments have used both approaches. The costs of incentives can be borne by general tax revenues, or derived from specific sources, including levies or import duties. The continued viability of certain communities and enterprises may be dependent on the availability of such funds if pollution control costs cannot be met from normal sources. The level of a country's economic development and its socio-economic system play major if not decisive roles in deciding these payment questions. In most countries the answers are not yet clear-cut: this is another subject requiring further study and exchange of information. Whatever method is used, payment questions have special implications for high-polluting industries engaged in foreign trade, as discussed below.

## B. Technological considerations

93. In determining what actions to take to control specific sources of pollution, consideration must be given to the capabilities and costs of the technical means

available. Increasingly stringent control measures imposed by governments are stimulating invention and innovation by enterprises to reduce abatement costs. In addition, governments of many industrialized countries are financing research and development programmes to improve control methods and systems. These essential efforts should continue to improve the performance of abatement equipment and reduce unit production costs associated with pollution control.

94. The fields of design - such as product, process and structural design - offer promising opportunities for pollution prevention. Examples include designing products for easy recycling, to have long useful lives, and in such a way that their energy consumption is no higher than is actually needed. Finally, they should where possible make the maximum use of materials whose own production and eventual disposal are relatively non-polluting. On experience so far, the widespread introduction of environmental considerations into the design field can be expected to produce major reductions in pollution in the long term, often at little or no cost and sometimes at considerable saving.

95. The world's store of pollution control technology is increasing rapidly; so are the problems associated with acquiring or transferring this technology within and among countries and of adapting it to new surroundings. Research is needed on these transfer and adaptation problems. Note should be taken of an initial guide for governments being prepared in the form of a supplementary paper by the Conference Secretariat describing selected major information sources of pollution control technology. This guide is designed to illustrate the variety and wealth of such information sources, and to increase awareness of opportunities for the transfer of pollution control technology.

### C. Economic and other measures to control pollution

96. A wide variety of economic and other measures exists for use at the national level for controlling pollution. Some, like mandatory compliance with standards, have been widely used for many years; others, such as discharge warrants, have been little used and are still largely in the formative stage. The utility of these measures depends on the goals which pollution control is designed to achieve. These goals generally take the form of standards: quantitative specifications of the maximum permissible levels of pollutants to be emitted or to be present in specific situations. They constitute the levels to which contaminants should be reduced or ceilings which should not be exceeded. They may also specify how operations are to be conducted or how products are to be made, or used.

97. Brief descriptions of selected measures follow. They are divided into groups to illustrate the fundamental differences in approach that can be taken in developing pollution control strategies: direct regulation, charges, other compulsory measures and incentives. No matter what measures are adopted, administrative problems can be expected in their execution and follow-up. Although their rational application depends on the prior setting of definite goals, efficient application is only likely if there is continual review and revision of these standards to accommodate new scientific findings and technological advances. In general, experience has indicated that two or more measures used in combination are more effective than one measure used alone. Selection will be influenced by national policies regarding who should pay for pollution control; selection should allow for the need to integrate these measures into the national planning framework.

98. It needs to be borne in mind that experience of pollution control is still limited in even the most highly industrialized nations, and several of the measures suggested below have hardly, if ever, been tried on a national scale. In general, it can probably be said that incentives tend to distribute costs to all, or part of, any given community, while charges tend to distribute costs directly to polluters or to users of polluting products and services. It should be appreciated that the statements that appear below relative to each group of control measures must be regarded as only illustrative: measures that may be suitable in one country or under one set of socio-economic conditions may not be applicable elsewhere. If only for this reason, there is an urgent need for exchange of information about the success or failure of whatever measures are adopted in different countries.

(i) Direct regulations

99. Mandatory standards. Standards can either be used as guidelines, or made compulsory. To be effective, mandatory standards must be realistic and require the establishment of workable inspection systems and effective enforcement procedures. At the national level, standards are usually enforced, if necessary, by court orders and subsequent litigation and penalties. The following general observations may be made about the use of mandatory standards in pollution control:

(a) they are relatively straightforward compared to many other control measures;

(b) they can be used to provide uniform conditions for all enterprises serving the same market, and thus "take the environment out of competition";

(c) their adoption places the costs of pollution control directly on firms or industries and on the consumers of their products;

(d) they enable penalties to be adjusted (at least theoretically) to levels needed to stimulate compliance;

(e) on the other hand, they create no incentive to reduce pollution below the statutory levels, and they may result in inefficient patterns of operation being adopted in order to conform to the set standards.

100. Complete prohibitions. Disallowance of either the discharge of a pollutant or of activities that lead to such a discharge is termed "complete prohibition". Since the environment has the capacity to assimilate certain pollutants without unacceptable risks, complete prohibition is seldom used. Examples of use at the national level are the prohibition of certain types of pesticides, and port regulations which prohibit the admission of oil tankers which do not conform to established standards laid down. Prohibition may also be temporary, as when incineration is banned locally during adverse meteorological conditions.

101. Licenses or permits. Licenses or permits can be required of persons or enterprises wishing to engage in polluting or potentially polluting activities. Prices of licenses or permits can be set in various ways including types of polluting activities and competitive bidding. Characteristics of the use of licenses or permits are:

(a) provision of means for periodic identification of polluters and of amounts of pollutant discharged;

(b) provision of means for restricting the number of enterprises engaged in polluting, or potentially polluting activities, and for controlling their equipment, process and training procedures.

(c) tendency to favour financially strong enterprises rather than those producing low levels of pollution, and to be inflexible and subject to manipulation to restrict the entry of new firms into activities that may produce pollutants.

102. Discharge warrants. Discharge warrants are negotiable instruments sold by a control agency to the highest bidder. They permit their owners to discharge specified quantities of pollutants into the air or water for specified periods of time.

Derived working levels, or quality standards[1], are translated into permissible quantities of discharges of various pollutants allowable under the standards. Discharges permitted by all warrants issued total permissible quantities under the standards.

103. Land use controls. Through zoning, performance specifications, and building codes governments can specify uses to which land can be put and place restrictions on those uses. Such controls can prevent air-polluting facilities from locating in stagnant-air basins, noise- and odour-polluting facilities from locating near residential areas, etc. To discharge loss of prime agricultural land, high prices can be set on farm land sold for non-agricultural use.

104. Best practicable means. Governments may require the "best practicable means" for the provision, efficient maintenance and proper use of appliances for preventing the escape of contaminents and the proper supervision of operations causing such emissions. This concept takes into account the effect of such measures on the operation of the process and their cost, since it attempts to preserve a balance between the amount of money to be spent and the degree of harm or nuisance involved. The obligation to use the "best practicable means" is continuing and may entail alterations in plant and method as new techniques become available. In a few cases the aim is to eliminate emissions altogether, but this is seldom practicable. In general, standards of tolerance have been drawn up which experience shows are attainable by the use of good plant if it is carefully supervised and operated. The standards are revised as improved techniques become available.

105. Liability (and insurance). The knowledge that suits for pollution damages are distinct probabilities under certain conditions serves as a deterrent to polluters and potential polluters. If potential damages are insurable, then damage payments cease to be a direct deterrent, but they may be replaced by operational standards imposed by the insurer. Unless certain standards are met, no insurance or only very expensive insurance may be obtainable. In a number of countries lawsuits are increasingly seeking injunctive relief to force prevention or abatement rather than seeking damages.

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1/ See para. 124 for a discussion of these terms.

(ii) Charges

106. Effluent charges. Where pollutant discharges into public sewers or into water or atmosphere can be measured and monitored, charges can be imposed by a control agency. Enterprises can decide to pay the charge or tax, reduce the level of activities causing pollution, or undertake pollution control measures such as treatment of wastes and recycling. The desired level of environmental quality can be met by adjusting the level of charges. The higher the charge, the more likely the polluter is to reduce pollution. Revenues produced by the charges can be used for abatement, damage clean-up, research on pollution control, etc. A variation of effluent charges is privilege-to-damage payments, such as payments by airlines to residents who suffer loss of environmental quality from excessive noise under airport traffic patterns. A number of factors may influence the decision to adopt the effluent charge system:

(a) they are theoretically an efficient system under certain conditions;

(b) they provide continual incentives for the abatement of pollution by its producers, and for the highest level of abatement per unit cost;

(c) they allocate resources efficiently by allowing product prices to reflect waste disposal costs and by permitting polluters to determine individually their "best" solutions;

(d) on the other hand, they may result in lengthy delays in reducing pollution if initial charges are set too low;

(e) they may be regarded by some conservationists as "licenses to pollute";

(f) sizeable costs may be involved in setting charges on a rational basis and in monitoring discharges.

107. Levies on uses of polluting products. A variety of charges can be made on the use of such polluting substances as leaded gasoline, high sulphur coal, and non-returnable containers. The levies can take various forms such as taxes to discourage use or deposits to encourage recycling. Graduated taxes can be placed on horsepower of internal combustion engines to encourage use of smaller engines with lower fuel consumption and reduced pollution. In some applications, levies are useful devices for indirectly influencing market behaviour when it is too difficult to monitor and charge effluents more directly. As compared with the other systems discussed above, levies:

(a) provide means for selectively discouraging the use of certain pollutant materials;

(b) are potentially flexible in that they can be adjusted to produce the desired behaviour;

(c) have a limited range of applications;

(d) are subject to accusations of discriminatory treatment.

108. Other compulsory measures . A variety of other compulsory measures are available for promoting environmental quality, including boycotts, witholding loans from local authorities, fines, moral suasion, and adverse publicity.

(iii) Incentives

109. Soft credit terms and grants. Governments can stimulate investment in pollution abatement techniques and equipment by granting interest-free or low-interest loans; or grants. The degree of incentive implicit in a loan can be increased through partial or total waiving of principal repayment. In the latter case, the loan becomes, in effect, a grant. The degree of incentive also varies with the amount of the loan or grant, and this in turn can be tied to progressively improved performance in reducing polluting effluents.

110. Tax incentives . Governments can provide tax credits, tax relief or accelerated depreciation for investment in abatement equipment and in industrial plants if these are located and performing in conformance with environmental planning criteria. The degree of incentive can be determined by credit or depreciation terms. Tax incentives:

(a) can only be used in countries with well-developed tax structures;

(b) require minimum administrative burden since they rely largely on responses rather than on detailed bureaucratic decree;

(c) can be implemented with limited time delay;

(d) help to soften the direct burden of initial expenditures for pollution control on enterprises and communities;

(e) may be too weak and uncertain to motivate desired action unless combined with direct regulation;

(f) may encourage inefficient abatement measures by rewarding unnecessarily large capital expenditure.

111. Awards and recognition. The use of awards and public recognition as instruments to change values and to motivate desired action can be significant stimulants for environmental action by individuals and public and private organizations. Awards can be monetary or they can be symbolic in nature, such as certificates or medals. They can be given for outstanding environmental achievements or for winning environmental competitions.

112. Other subsidies and compensations. These may take many forms, such as dislocation allowances; payments to persuade a party to use a high-priced, low-polluting, substitute for a low-prices, high-polluting, substance; and use of government purchasing power to stimulate development and markets for innovative pollution control devices, processes or designs. In general, subsidies may be useful because they:

(a) can accommodate specific needs of individual cases;

(b) tend to reduce objections to pollution control regulations on the part of firms causing pollution.

At the same time, however, they may:

(c) result in long-term distortions of relative prices;

(d) present difficulties in determining the sizes of subsidy necessary to motivate action in any given instance.

## D. Environmental legislation and institutions.

113. Pollution strategies require legislation and governmental institutions to enunciate policy, develop objectives, and formulate and implement programmes. National practices in these regards vary widely. Note is taken of another initial guide to governments, being prepared for the Conference Secretariat in the form of a supplementary paper, presenting the results of a survey of recent national legislation and institutional arrangements relevant to environmental matters in a majority of nations. The survey is designed to provide governments with a view of what others are doing. It may assist in reducing international pollution problems by helping to harmonize voluntary national actions.

## E. International economic implications.

114. Many efforts to control pollution at the national level will have little or no direct international economic impact. Installation and operation of many sewage treatment plants, for example, can be considered to have primarily national impact, except to the extent that associated costs may reduce the purchasing power of the country for imported goods and services.

115. In other cases where pollution control measures significantly increase prices of goods for export markets or relative to imported and competing goods, the consequences may take several forms. First, the affected domestic enterprise may decide to relocate to a country with less stringent environmental controls. Second, the enterprise may seek government subsidization of all or part of its pollution control costs. Third, sales by the enterprise may decrease in either or both its domestic and foreign markets, and sales by its competitors may increase correspondingly. Fourth, it may seek tariff protection, claiming it is being penalized for environmentally responsible action, or it may seek some form of non-tariff protection, such as import quotas.

116. In other cases, pollution control measures may affect foreign trade by reducing imports of products, foodstuffs, or raw material which fail to meet minimum environmental standards specified by law. On the other hand, it is possible that standards may increase markets, especially for developing nations, of certain products like natural fibres to replace high polluting synthetics.

117. Both GATT and UNCTAD have urged governments to avoid the use of trade barriers in environmental matters. When actions are needed, such as import restrictions on high sulphur content fuel oil, these international bodies have urged that trading partners be notified in advance and that consultations be held as necessary regarding possible compensatory actions. Particular concern has been expressed about implications for developing countries since they may be more vulnerable to decreases in exports than are industrialized countries.

118. At present, so little is known about how pollution control measures will actually affect unit production costs that resulting international implications such as those identified above have largely been subjects of speculation. This points again to the need for better cost data from enterprises, and to the need to stay abreast of major developments in pollution control technology which might significantly reduce costs in the high polluting industries, such as non-ferrous metals, iron and steel, pulp and paper, and chemicals.

119. Certain enterprises, countries, and intergovernmental bodies have advocated harmonization of pollution control regulations among nations to remove the element of

competition from environmental actions. This would allow governments and enterprises, it is argued, to protect environmental quality without being penalized by less environmentally concerned enterprises or policy-makers in other countries. On the other hand, arguments are made that regulations should vary among nations, depending on national priorities (which are closely related to social values and these, in turn, to living standards); and on the comparative abilities of local environments to assimilate additional contaminating effluents. This issue, together with other implications of pollution control action, are discussed in the context of development in Subject Area V.

## Chapter VI

## INTERNATIONAL CO-OPERATION FOR POLLUTION CONTROL

120. THE PRECEDING CHAPTERS HAVE SUGGESTED THE INTENSITY AND EXTENT OF CURRENT POLLUTION PROBLEMS:

- the rates at which a number of substances are circulated naturally in the biosphere as a result of processes such as weathering are being altered by man, and many naturally occurring substances are being introduced by man in amounts that exceed the capacity of the biosphere to recycle them;
- similar problems are being created by the increasing number and volume of synthetic compounds that are released by man to an environment that often has no ready mechanism to reduce them to harmless materials;
- the behaviour of many of these pollutants in the biosphere is very complex, with transfers among various media, transport over long distances, accumulation in food chains and various effects on man, other living organisms and resources;
- added to these complexities is the possibility that future effects may be as important as those detected so far, and remedial action taken now may not be effective in reducing the levels of pollutants for some time.

121. INTERNATIONAL CO-OPERATION FOR POLLUTION CONTROL. National action to control these problems is of prime importance, but international co-operation:

- may increase the effectiveness of national action, and
- enable States to achieve results they cannot achieve alone.

122. THE OVER-ALL OBJECTIVE OF POLLUTION CONTROL IS TO PROTECT AND ENHANCE HUMAN WELL-BEING:

- within this over-all objective, other more restricted objectives may be chosen:
  - protection of human health
  - protection of organisms, or populations, other than man, and
  - protection of other resources.

123. IN APPROACHING THESE OBJECTIVES AT THE INTERNATIONAL LEVEL A NUMBER OF PRINCIPLES ARE RECOGNIZED:

- priority should be given to problems of international significance most directly related to the protection and enhancement of human well-being;
- all measures should be designed to achieve maximum effectiveness for the effort expanded with minimum disruptive effects on beneficial human activities;

- regional and local variations in the effects of pollutants and in the evaluation of the importance of those effects should be taken into account;
- gaps and uncertainties in scientific knowledge, as well as the complexity of the problems themselves, should be recognized; policies should be adaptable to changes in scientific knowledge;
- existing international organizations, both inside and outside the United Nations system, should provide forums for international discussions as well as advice and assistance to States;
- all measures should be designed and implemented taking fully into account the sovereign right of each State to formulate and carry out its own environmental policies.

124. SINCE THERE IS AT PRESENT NO STANDARD USAGE, A NUMBER OF TERMS HAVE BEEN DEFINED BY THE PREPARATORY COMMITTEE FOR THE DISCUSSION OF INTERNATIONAL CO-OPERATION FOR POLLUTION CONTROL AT STOCKHOLM:

- exposure: the amount of a particular physical or chemical agent that reaches the target;
- target (or receptor): the organism, population or resource to be protected from specified risks;
- risk: the expected frequency of undesirable effects arising from a given exposure to a pollutant;
- criteria (or exposure-effect relationships): the quantitative relations between the exposure to a pollutant and the risk or magnitude of an undesirable effect under specified circumstances defined by environmental variables and target variables;
- primary protection standard: an accepted maximum level of a pollutant (or its indicator) in the target, or some part thereof, or an accepted maximum intake of a pollutant or nuisance into the target under specified circumstances;
- derived working levels (or limits): maximum acceptable levels of pollutants in specified media other than the target designed to ensure that under specified circumstances a primary protection standard is not exceeded;

  derived working levels are known by a variety of names, including environmental or ambient quality standards, maximum permissible limits and maximum allowable concentrations. When derived working levels apply to products such as food or detergents, they may be known as product standards;

- the maximum acceptable release of a pollutant from a given source to a specified medium under specified circumstances may be termed a discharge (or effluent or emission) standard or a release limit. Effluent charges levied on the release of pollutants and materials taxes or price adjustments levied on materials which may become pollutants may also be used to limit the release of pollutants;
  - in order to meet discharge standards or release limits, it may be necessary set various types of technological standards or codes of practice concerned with the performance and design of those technologies or operations leading to the release of pollutants; or
- derived working levels and the various means used to meet them are collectively termed derived standards and other controls;
- action level: the level of a pollutant at which specified emergency counter-measures, such as the seizure and destruction of contaminated materials, evacuation of the local population or closing down the sources of pollution, are to be taken.

## A. Pollution problems of international significance

125. THE CHOICE OF INTERNATIONAL POLICIES FOR POLLUTION CONTROL DEPENDS ON THE REASONS FOR CONSIDERING A POLLUTANT TO BE OF INTERNATIONAL SIGNIFICANCE:

- intergovernmentally agreed policies are more likely to be needed when what one State does or does not do about a pollutant affects other States or the common interests of States;
- the physical proximity of the States affected, their trade relations, their political and economic systems and their stages of development, are likely to be important factors in determining the appropriate intergovernmental forum for considering a given problem.

126. THE DISTRIBUTION OF POLLUTANTS BEYOND THE NATIONAL JURISDICTIONS IN WHICH THEY ARE RELEASED MAY MAKE THEM OF INTERNATIONAL SIGNIFICANCE:

- concern with such problems may be global, as with radioactive fallout and organochlorine compounds that are widely distributed throughout the world, but it is more often regional, as with pollution of the River Rhine or with the atmospheric transport of sulphur dioxide across national boundaries in Europe;[1]

- some problems of this type may be dealt with on the basis of the concept of the sovereign equality of States;
  - this concept was applied in the Trail Smelter Arbitration, which found one State "responsible in international law" on the grounds that "no State has the right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another or the properties or persons therein, when the case is of serious consequence and the injury is established by clear and convincing evidence";[2]
- the 1959 Antarctic Treaty and the 1963 Partial Test Ban Treaty, as well as a number of regional agreements, have demonstrated the willingness of States to co-operate in a variety of steps to reduce the likelihood of undesirable effects from activities under their jurisdiction to other States or to the common interests of States;
- further measures to deal with such problems on both a global and a regional basis will be needed.

127. POLLUTION PROBLEMS MAY ALSO BE OF INTERNATIONAL SIGNIFICANCE BECAUSE OF INTERNATIONAL TRADE:

- the production of certain goods causes the release of pollutants to the environment; the costs of controlling such releases may on the one hand, be an obstacle to the adoption of control measures and, on the other hand, can give rise to comparative advantages for States with relatively low levels of pollutants in the environment;
  - governments should not try to avoid such obstacles to pollution control or attempt to offset added costs due to pollution control by creating barriers to international trade;

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[1] See Air pollution across national boundaries: the impact on the environment of sulphur in air and precipitation, Swidish case study for the Conference.

[2] United Nations Reports of International Arbitral Awards, Vol. III, pp. 1965-1966.

- the transport or use of some goods may also cause pollution; non-tariff barriers may arise as a result of variations in national standards for the goods themselves or for their transport or use;
  - . the creation of such non-tariff barriers should be avoided
  - . international trade in food that may contain pesticide residues and other contaminants is being handled through the development of international standards by the FAO/WHO Codex Alimentarius Commission;
- on all pollution problems of international significance because of international trade, States should notify, and consult with, other concerned States even though there may be no legal obligation to do so;
  - . consultative mechanisms have proved their usefulness in a number of areas, including not only international trade but also unilateral intervention on the high seas in cases of oil pollution casualties, and activities and experiments in outer space and on the moon.

128. EVEN WHEN THE EFFECTS OF POLLUTANTS ARE LIMITED AND INTERNATIONAL TRADE IS NOT INVOLVED, POLLUTION PROBLEMS MAY BE OF INTERNATIONAL SIGNIFICANCE BECAUSE OF THEIR COMMON OCCURRENCE IN MANY STATES:

- some of the most acute pollution problems are of this type, including problems arising from domestic sewage, the contamination of drinking water, and air pollution in urban areas;
- such problems may cause the duplication in a number of States of costly and often complex efforts to find effective means of control. International co-operation can assist by providing States with expertise that might otherwise not be available, even in industrialized countries;
- since local conditions vary, international co-operation in the control of such problems is often best handled through non-binding recommendations, as in the case of the European Standards for Drinking Water and the recommendations on dose limits of the International Commission on Radiological Protection.

129. THERE IS NEED FOR AN INTERGOVERNMENTAL MECHANISM FOR DETERMINING WHICH POLLUTION PROBLEMS ARE OF INTERNATIONAL SIGNIFICANCE AND FOR DEFINING THE PATTERN AND SCOPE OF INTERNATIONAL CONCERN:

- this would supplement the various forums already available to States for this purpose;

- provision should also be made for referring pollution problems of international significance to organizations competent to assist in organizing co-operation for pollution control and for considering other appropriate means when competent organizations do not exist.

## B. Assessment

130. THE ASSESSMENT OF EXPOSURES AND RISKS, AND IDENTIFICATION OF PATHWAYS AND SOURCES DEPEND ON BOTH MONITORING AND RESEARCH:

- the design of international co-operation for monitoring and research, needs for which are outlined below, should take into consideration the special needs of pollution control as well as the general need for more knowledge of pollutants and their behaviour;
- the data required for international assessments should be provided by States at the suggestion of the competent international organizations.

131. THE ASSESSMENT OF RISKS IS AN OBJECTIVE PROCEDURE BUT WELL-INFORMED JUDGMENTS MAY OFTEN BE REQUIRED BECAUSE OF GAPS AND UNCERTAINTIES IN SCIENTIFIC KNOWLEDGE. SUCH JUDGMENTS MAY BE PARTICULARLY IMPORTANT FOR:

- exposures that may occur in the future either as a result of increases in the release of a pollutant or as a result of its accumulation, whether through food chains or otherwise, in the target;
- low levels of exposure whose effects have not been observed, and it may, therefore, be appropriate to make simple assumptions such as a linear relationship between exposure and the risk or magnitude of an effect below a given level.

132. IT IS IMPORTANT NOT ONLY TO IDENTIFY PATHWAYS AND SOURCES BUT ALSO TO ASSESS THEIR RELATIVE IMPORTANCE IN DELIVERING THE EXPOSURE TO THE TARGET:

- it is of particular importance to determine critical pathways, that is those through which the greater parts of the transfer from the sources to the target takes place, and critical sources or types of sources that are at the start of critical pathways;
- such critical sources or types of sources are not necessarily those which release the greatest quantities of pollutant in question to the environment.

133. THE QUANTITATIVE ASSESSMENT OF EXPOSURES, RISKS, PATHWAYS AND SOURCES SHOULD BE THE RESPONSIBILITY OF INTERGOVERNMENTAL EXPORT COMMITTEES OF THE UNITED NATIONS:

- this will provide both for the expertise needed to carry out these tasks and for the prestige needed to achieve widespread recognition of the results;

- since the capacity to perform such assessments is limited, priority should be given to pollutants that may pose significant risks but whose control is likely to have disruptive effects on beneficial human activities, that are of international significance and that are of broad international concern.

134. RECOGNIZING THAT THERE ARE MANY POLLUTANTS FOR WHICH SUCH ASSESSMENTS MAY BE NEEDED ORGANOCHLORINE AND HEAVY METAL COMPOUNDS APPEAR TO DESERVE HIGHEST PRIORITY AT THE PRESENT TIME:

- both organochlorine and heavy metal compounds are used extensively for beneficial purposes, but as pollutants they appear to pose significant risks to man's well-being, either directly or through their effects on other organisms and resources of use to man;[1]
- these compounds are of international significance for a number of reasons:
  - . compounds such as DDT and PCBs are distributed widely beyond the national jurisdictions in which they are released to the environment, are traded internationally and are of concern to many States;
  - . heavy metals such as mercury and lead are also distributed widely beyond the national jurisdictions in which they are released to the environment, are found in products such as fish that are traded internationally and are of concern to many States;
- much information is already available on organochlorine and heavy metal compounds, but this information has not been adequately assessed quantitatively.

## C. Development of primary protection standards and derived working limits

135. WHETHER SUCH STANDARDS HAVE BEEN DEVELOPED OR NOT, IT SHOULD BE AXIOMATIC THAT THE LEVELS OF POLLUTANTS SHOULD BE KEPT AS LOW AS READILY ACHIEVABLE, SOCIAL AND ECONOMIC FACTORS BEING TAKEN INTO ACCOUNT:

- maximum acceptable levels should not be reached if levels below this can readily be achieved;
- if current levels are already above a standard, the standard may be viewed as a goal.

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[1] See for instance, Control of polychlorinated biphenyl compounds in the United Kingdom Mercury crisis in Canada, op. cit.

136. A PRIMARY PROTECTION STANDARD SHOULD BE BASED ON A WEIGHING OF THE BENEFITS AND COSTS OF AVOIDING OR REDUCING SPECIFIED RISKS:

- at the maximum acceptable level the costs should be less than the benefits;
- the maximum acceptable level is not necessarily a threshold below which no risk is incurred, even if such a threshold exists, since some risk may be considered acceptable in the light of the costs of bringing levels below the threshold;
- primary protection standards and derived working limits are levels that should not be exceeded during the routine operation of the sources and they may in fact be designed so that they cannot be met unless appropriate controls on the sources are operating properly.

137. THE DIFFICULTIES OF DEVELOPING PRIMARY PROTECTION STANDARDS AND DERIVED WORKING LIMITS ARE CONSIDERABLE, PARTICULARLY ON THE INTERNATIONAL LEVEL:

- the risks to be avoided are a matter of choice and this choice may reflect social and economic conditions and cultural and ethical preferences which are not necessarily the same throughout the world or even among the concerned States;
- the costs of avoiding given risks as well as the ability and willingness to meet these costs may vary with social and economic conditions;
- it may not be possible to formulate costs and benefits in comparable terms;
- as a result, even when the same assessments of risk are widely applicable, primary protection standards and derived working limits may need to be developed locally;
- only for relatively few pollutants are standards likely to be applicable globally or even regionally.

138. INTERNATIONAL PRIMARY PROTECTION STANDARDS AND DERIVED WORKING LIMITS CAN BE USED:

- to limit risks that affect more than one State or the common interests of States and as the basis for equitably distributing the burden of controlling sources among a number of States;
- to assure that the comparative trade advantage of having low levels of pollutants in the environment is fully realized and to avoid obstacles to pollution control;
- to develop international product standards and technological standards so that non-tariff barriers are not created;

- when problems are common to a number of States to avoid duplication of very complex standard-developing activities in the States concerned.

139. EVEN SOMEWHAT ARBITRARY WORKING LIMITS MAY BE USEFUL:

- when the lack of such a limit leads either to the prohibition of activities that are known to be beneficial or to a complete lack of controls on the release of pollutants that are known to pose some risk;
- as a basis for developing controls on sources;
- to provide levels against which the effectiveness of controls can be checked.

140. EFFECTIVE INTERNATIONAL CO-OPERATION FOR POLLUTION CONTROL DOES NOT NECESSARILY IMPLY INTERGOVERNMENTAL AGREEMENT ON PRIMARY PROTECTION STANDARDS AND DERIVED WORKING LIMITS:

- international standards recommended by the competent international organizations may, however, be useful even if they are not legally binding on States;
  - . the development of recommended primary protection standards should be the responsibility of expert bodies that have competence to consider both the benefits and costs of avoiding risks
  - . the development of recommended derived working limits should be the responsibility of expert bodies competent with respect to particular media;
- international standards recommended by competent bodies should be taken into account when national standards for pollutants of international significance or intergovernmental agreements on standards are being formulated.

141. THE DEVELOPMENT OF DERIVED WORKING LIMITS FOR POLLUTANTS IN FOOD, WATER AND AIR DEMANDS HIGH PRIORITY:

- the levels of pollutants in food, water and air can have direct effects on human health and on resources of economic importance, as described above;
- the effects of water and air pollutants are in some cases not limited to the national jurisdictions in which they are released to the environment; international river basins and regions in which the border between States runs through densely populated or industrialized areas are of particular importance in this regard;
- international trade in food that may contain contaminants makes the need for international co-operation particularly great;
  - . some countries permit export of food which does not comply with either international standards or certain regulations under their own laws

developing countries often lack legislation, regulations or an effective food control organization to deny entry to such foods.

142. INTERNATIONAL STANDARDS FOR POLLUTANTS IN FOOD AND WATER ARE CURRENTLY BEING DEVELOPED:

- international food standards, including tolerances for pesticide residues as well as food additives and other contaminants, are being developed by the Joint FAO/WHO Codex Alimentarius Commission;
- international standards for drinking water have been developed by WHO and are cited in the International Sanitary Regulations as applicable at international ports and airports; FAO is developing standards for agricultural uses of water and for fisheries.

143. STRENGTHENING AND EXTENSION OF CURRENT ACTIVITIES ARE BOTH NEEDED:

- with respect to food contamination, there is a need to accelerate the work of the Codex Alimentarius Commission and to develop a code of ethics for international trade in food;
- with respect to water pollution, there is a need for the development of derived working limits for uses of water other than drinking, as well as a need to keep the international standards for drinking water under review;
- with respect to air pollution, action is required for the development of derived working limits for common air pollutants such as sulphur dioxide, suspended particulate matter, oxides of nitrogen, carbon monoxide and oxidants;
- for other air and water pollutants such as toxic metal compounds and organochlorine compounds, assessments as suggested above are needed, the total intake from air, water and food, serving as a basis for the development of primary protection standards.

## D. Control of the sources of pollution

144. THE SOURCES OF A POLLUTANT SHOULD BE CONTROLLED THROUGH THE USE OF DISCHARGE STANDARDS OR OTHER CONTROLS:

- ideally, these should be designed so as to achieve levels in the target not higher than a primary protection standard;
- relying on such routine controls has significant advantages over the use of action levels, whose use should be limited to uncontrollable or emergency situations;

- international agreement on action levels and in most cases on discharge standards is unlikely because of the many variations in local circumstances.

145. THE NEED FOR DERIVED STANDARDS AND OTHER CONTROLS MAY VARY WIDELY WITH ENVIRONMENTAL VARIABLES, INCLUDING THE NUMBER OF SOURCES:

- more than one combination of derived standards and other controls may lead to levels below a primary protection standard;
- there may, therefore, be a problem of deciding how to apportion the allowed discharge among a number of sources and types of sources, particularly those identified as critical.

146. PRINCIPLE OF THE "BEST PRACTICABLE MEANS" FOR LIMITING POLLUTION:

- when the benefits of avoiding the risks caused by a given release of a pollutant are thought to outweigh the costs of limiting that release, it may be appropriate to control sources by the best available, practicable, or economically feasible means, even if no primary protection standard or derived working limit for that pollutant exists;
- it may also be appropriate to require that the release of a pollutant be reduced without citing a specific discharge standard;
- such action does not, however, lessen the need for the development of a primary protection standard against which the effectiveness of these measures can be checked and the need for them evaluated.

147. CHARACTERISTICS OF CHEMICAL POLLUTANTS THAT SUGGEST POTENTIALLY HIGH RISKS TO MAN AND OTHER ORGANISMS INCLUDE:

- extensive or large-scale input (by man relative to the natural input) into the biosphere;
- persistence;
- serious adverse effects.

148. SOME SUBSTANCES WITH THESE CHARACTERISTICS HAVE ALREADY BECOME WIDELY DISTRIBUTED IN THE ENVIRONMENT:

- while it is not justifiable, in the light of the costs involved, to prohibit the release of these substances to the environment throughout the world, the risks they pose and may pose have been the subject of broad international concern;

- for organochlorine compounds and heavy metals such as mercury, cadmium and lead, the costs of reducing releases do appear to be less than the benefits of doing so, except where their use is essential to human health or to food production; reductions in their release appear, therefore, to be advisable.

149. THE USE OF THESE AND OTHER SUBSTANCES HAS ALREADY BEEN PROHIBITED OR OTHERWISE STRICTLY CONTROLLED IN SOME STATES:

- since many of these substances are traded internationally, there is concern about the possibility of controls in one State having adverse effects on other States where information on the environmental effects of the substances is not available;
- States that have taken action of this type should, therefore, provide on the request of States importing these substances all pertinent information on their effects.

150. MOREOVER, MANY NEW PERSISTENT OR HIGHLY TOXIC SUBSTANCES ARE BEING MANUFACTURED AND USED:

- States should prohibit the large-scale or extensive release to the environment of such substances unless their likely effects in the environment have been assessed.

## E. Review and revision mechanisms

151. REVIEW OF MEASURES TAKEN IS AN ESSENTIAL PART OF INTERNATIONAL CO-OPERATION FOR POLLUTION CONTROL:

- review may be particularly important when
  - . new effects, pathways or sources of pollutants are discovered
  - . new technologies, whether control technologies or technologies that may lead to the release of pollutants, are being developed
  - . new chemical or physical agents with characteristics such as persistence or toxicity are produced in large amounts
  - . new trade patterns are established or new products are traded internationally.

152. REVIEW, AND REVISION AS REQUIRED, OF INTERNATIONAL DERIVED STANDARDS AND OTHER CONTROLS SHOULD BE UNDERTAKEN BY INTERNATIONAL ORGANIZATIONS COMPETENT WITH RESPECT TO PARTICULAR MEDIA AND SOURCES:

- co-operation between two or more international organizations may often be required, as is already frequently the practice;

- whenever possible, review of this type should be undertaken in the light of primary protection standards developed by the competent international organizations.

153. THERE IS ALSO A NEED FOR OVER-ALL POLICY REVIEW AND CO-ORDINATION FOR PARTICULAR POLLUTANTS IN ALL RELEVANT MEDIA FROM WHATEVER SOURCE TO ENSURE THAT:

- needed measures are taken, including the development of primary protection standards for various targets and the development of the derived standards and other controls needed to meet these primary protection standards;
- measures taken in regard to various media and sources are consistent with each other and with primary protection standards.

154. ANY INTERGOVERNMENTAL MECHANISM CONCERNED WITH ENVIRONMENTAL PROBLEMS SHOULD INCLUDE AMONG ITS FUNCTIONS OVERALL POLICY CO-ORDINATION AND REVIEW OF INTERNATIONAL CO-OPERATION FOR POLLUTION CONTROL:

- maintenance of a registry of international standards that have been developed under the auspices of the competent international organizations and that are consistent with overall policies would be useful.

## Chapter VII

## SPECIFIC AREAS OF NEEDED ACTION

155. TO BE EFFECTIVE, POLLUTION CONTROL REQUIRES A NUMBER OF DISTINCT BUT COMPLEMENTARY ACTIONS:

- at the national level comprehensive pollution control programmes must be developed as needs arise;
- research and monitoring are necessary to define quantitative relationships needed to develop standards, and also to fill gaps in the knowledge of pollutants and their control;
- once governments have set environmental goals and standards have been developed, monitoring is needed to check the effectiveness of pollution control measures;
- at the international level, training, education, technical assistance, information exchange, and other measures are needed to harmonize national efforts, encourage broad participation and make the process effective on a global basis.

156. THESE ACTIONS NEED TO BE TAKEN IN A NUMBER OF DIFFERENT AREAS1/

- health;
- food;
- air and climate;
- terrestrial ecology;
- the oceans.

157. INTERNATIONAL ACTIVITIES SHOULD SUPPORT NATIONAL PROGRAMMES AS WELL AS CARRY OUT INTERNATIONAL ONES:

- while most research investigations will take place at the national level, co-ordination is required at the international level to minimize duplication, assist in priority-setting and scheduling of projects, and encourage pertinent collaboration among investigators;
- mechanisms should be devised at the international level for rapid and efficient referral and exchange of information on the results of research and monitoring programmes;

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1/ The first four areas given below are discussed here; a comprehensive approach to the problem of marine pollution appears in Chapter VIII.

- arrangements need to be developed to establish compatibility among different procedures and programmes, the compatibility of their results in different countries, and so facilitate exchanges of research and monitoring data and samples.

158. THE CREATION OF NATIONAL CAPABILITIES FOR POLLUTION CONTROL REQUIRES SPECIAL HELP FROM INTERNATIONAL AND OTHER ORGANIZATIONS:

- initial training of the environmental specialists urgently required in some countries can be carried out at the national level. More advanced training may need to be done through fellowships abroad or technical assistance implemented locally;
- technical assistance can be furnished in many forms including guidance in drafting legislation and in solving technical problems, provision of contractual services for the design and construction of pollution control facilities and of research and other instruments, and assistance in developing local or national pollution control programmes;
- assistance can also extend from the development of local institutions such as environmental educational and research establishments and pollution control departments in governments, to the recruitment of staff and the implementation of field projects.

159. THE ESTABLISHMENT OF MONITORING NETWORKS REQUIRES CLEARLY DEFINED OBJECTIVES AND PRINCIPLES 2/

Monitoring is a system of continued observation, measurement, and evaluation for defined purposes.

(a) Objectives:

- Increasing quantitative knowledge of:
  - . natural and man-made changes in the environment and of the impact of these on man's health and welfare
  - . the environment, including the means by which dynamic balance is maintained in ecosystems, as a basis for managing resources;
- providing early warning of significant environmental changes (including natural disasters) to facilitate consideration of protective measures;

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2/ This section is based on the Report of the Intergovernmental Working Group on Monitoring or Surveillance (A/CONF.48/IWGM.1/8)

- making it possible to check the effectiveness of established regulatory mechanisms and to plan optimal technological developments.

(b) Guiding principles:

- intergovernmental co-operation in monitoring should build as much as possible on existing national and international systems;
- existing United Nations agencies should be used to the maximum extent possible as the institutional base for co-ordinating and implementing monitoring programmes. It is essential to improve co-ordination mechanisms within the United Nations framework;
- with regard to monitoring on an international basis, priority should be given to global and regional (multi-national) problems;
- the exchange of information about local problems that are of wide occurence, and about the methods used to monitor them, is of high importance;
- special emphasis should be given in global monitoring to the variables of most critical importance that are capable of adequate scientific measurement at the present time. Where the measurement techniques for variables of critical importance are deficient, special attention should be given to their development;
- monitoring systems should be designed to meet clearly-defined objectives, and the arrangements for the evaluation of the data must be an integral part of the design of the system;
- countries that agree to participate in a system of global or regional monitoring incur an obligation to exchange promptly appropriate data or evaluations of the data, especially in relation to the early warning of natural disasters;
- as international monitoring implies the participation of many nations, assistance, including training and financial support, should be given, where necessary, to ensure the effective involvement of appropriate countries without regard to their stage of economic development;
- countries should share the responsibility for implementing international monitoring systems in areas outside national jurisdiction such as oceans and space. Activities carried out on national territories will be the responsibility of the countries concerned.

## A. Health effects

160. MANKIND IS INCREASINGLY EXPOSED TO ENVIRONMENTAL POLLUTANTS

- some of these are organisms that have long caused disease in humans but whose pathogenic role could be enhanced by rapid changes in society;
- others are chemical and physical pollutants, many of them new and with inadequately known toxicities, that are being introduced into the environment intentionally or as by-products or wastes from technological processes.

161. INTERNATIONAL ACTION IS URGENTLY REQUIRED

The spread of cholera, the increasing frequency of food-borne infections throughout the world and the geographic differences in the prevalence of various types of malignancies, possibly caused by differences in exposure to environmental agents, are evidence that such problems are not confined within national boundaries, and that present safeguards are inadequate even in countries where such matters receive considerable attention.

162. PROGRAMMES FOR DETECTION AND ASSESSMENT OF LONG-TERM EFFECTS OF ENVIRONMENTAL AGENTS, PARTICULARLY OF NEW CHEMICALS AND THEIR BREAKDOWN PRODUCTS, ARE URGENTLY NEEDED:

- a screening capability is needed to identify substances that have long-term deleterious effects and that should therefore not be released indiscriminately into the environment;
- bio-assay procedures for determining mutagenicity, teratogenicity and carcinogenicity (i.e., the induction of hereditary changes, of defects of pre-natal development, and of malignancies) are particularly inadequate;
- there is therefore need for internationally acceptable testing procedures and criteria for evaluation of long-term hazards of specific contaminants;
- because of the expense of such investigations and the time required, it is essential that they should be shared among a number of countries.

163. DATA ON MAN HIMSELF PROVIDE THE SOUNDEST BASIS FOR SUCH ASSESSMENT

Although much effort has been expended to obtain epidemiological information on the effects of physical, chemical and biological pollutants on man, current methods are inadequate to answer many questions. The assessment of changes in health status (as measured by epidemiological indices) and of exposure to environmental agents is still deficient.

164. SUCH DATA SHOULD BE SUPPORTED BY RELEVANT SCREENING, RESEARCH AND MONITORING PROGRAMMES:

- development of animal screening and testing programmes making use of toxicological and other experimental methods;
- research on the effects of environmental pollutants particularly the long-term effects of low-level exposures, through epidemiological and related field studies;
- monitoring programmes to provide basic data on health status, levels of environmental agents and their accumulation in human tissues;
- specific research to improve control programmes of water supplies.

(i) Methodology

165. Criteria for evaluating the validity of toxicological tests. The difficulty of specifying the experimental variables that can affect the outcome of a test for long-term effects of a toxic agent leaves the applicability to man of many experimental findings open to serious criticism. A multidisciplinary approach, involving specialists in a wide range of scientific and medical fields and including applied mathematicians, is required for the design of such experiments.

166. Correlation of in vitro and in vivo testing. Certain in vitro tests may serve as screening indicators and means for assessing synergism or antagonism among environmental contaminants. However, correlation between these tests and in vivo toxicity studies is indispensable to interpreting the results.

167. Extrapolation from animals to man: Comparative sensitivity and toxicity studies in a variety of animal species. Toxicological studies should be undertaken in selected species, including primates, to ascertain reasons for differences in their response to toxic substances. Before such studies can be carried out, standardized methods will have to be developed for following the absorption, distribution, and fate of chemical agents in these species.

(ii) Areas of study

168. LABORATORY RESEARCH IS ESPECIALLY NEEDED ON THE LONG-TERM EFFECTS OF LOW-LEVEL EXPOSURE TO VARIOUS PATHOGENIC AGENTS:

- mutagenesis. Genetic effects manifest themselves infrequently and can be detected and quantitatively assessed only in large-scale experiments. Improved methodology and expanded studies of the mutagenic effect of continued exposure to environmental contaminants are urgently needed;

- teratogenesis. Test procedures for the assessment of teratogenic effects are also required. Adequate experimental and other methods will have to be developed;
- carcinogenesis. Carcinogenic effects may only become apparent after a long latent period and therefore require long observation times. Additional research is necessary to overcome the difficulty now encountered in routine testing for these effects;
- combined exposure to pollution and infection. Further research should be undertaken on potential synergism between pollutants and infectious agents.

169. EXPERIMENTAL RESEARCH SHOULD BE COMBINED WITH STUDIES OF THE EFFECTS OF ENVIRONMENTAL AGENTS UNDER NATURAL CONDITIONS IN THE FOLLOWING AREAS:

- development of methods for epidemiological studies. Intensive research is required to develop better epidemiological indices measuring changes in health status with respect to biological, physiological and psychological factors. Uniform and reliable methods of measuring pollutants and assessing exposure are also needed;
- natural history of environmental agents. Little information is available as to total amounts, distribution, levels and trends of environmental pollutants, and international effort is needed to collect and evaluate data in a uniform manner. To identify "critical" pathways, "critical" pollutants, and "critical" populations groups, further study is needed of the chemical changes and the accumulation processes that a substance undergoes as it moves along its path or paths from the source to the target organisms and particularly to man;
- the nutritional quality of man's diet and his total intake of actually or potentially harmful substances. To understand the relationship between man and his environment it is essential to assess the quality of his diet and his total intake of those man-made or natural substances that are likely to have a significant effect on his health. These include naturally occurring toxic substances and those introduced by, for example, agricultural technology and industrial processes. The total intake can only be determined by integrating the results of air, water and food monitoring with those of properly designed nutritional surveys. These studies will help to identify high-exposure population groups, in relation to their living, dietary and other habits;

- epidemiological aspects of carcinogenesis and teratogenesis. Occupational carcinogenesis research should be intensified and more attention should be given to recording in detail the occupational experience of cancer patients. Marked geographic differences in cancer incidence should be the subject of intensive research. Efficient early-warning systems for potentially teratogenic environmental agents require collection and evaluation of data on occurrence of congenital malformations in man and other animals;
- follow-up of highly exposed and of sensitive populations. Controlled long-term follow-up studies should be made of defined population groups subjected to unusually high or low exposure to pollutants, and of sensitive segments of the general population such as children, aged and diseased persons;
- epidemiological studies on animals. Epidemiological studies of pollutant effects on the natural recipients of pollution, such as wild and domestic animals, would give valuable information supplementing that from epidemiological studies on human populations.

170. MONITORING PROGRAMMES TO SUPPORT THE ABOVE RESEARCH SHOULD COVER A WIDE RANGE:

- monitoring of health status. Planning and execution of national and international environmental health programmes require, in addition to vital and health statistical data, data about those variables in man's environment that are either known or presumed to be related to such data;
- systems of recording diseases and causes of death should be modified to make health statistics relevant to environmental health assessment;
- monitoring of environmental substances in human tissues. In order to understand and assess the possible effects of pollutants on human health it is necessary to determine the concentration and distribution of these chemicals and their metabolites in the human body. The possible value of tissue banks in the retrospective assessment of health trends and levels of exposure should be explored.

171. RESEARCH TO IMPROVE WATER QUALITY[1]

- research is needed on environmental factors that influence the biological cycles of waterborne pathogens such as those leading to bacterial viral or parasitic diseases - e.g. cholera, infective hepatitis and amaebiasis - especially in the developing countries;
- direct health effects of uses of polluted water. Intensified, internationally co-ordinated research is required on the relationship of human health to the microbiological and chemical qualities of waters (including sea water) used for other than drinking purposes (e.g., recreation, agriculture, industry);
- water and waste water treatment processes. Research is needed on the production of safe water from waste water. Subjects requiring study include techniques for the reduction or elimination of microbial and chemical agents from waste water; the cost effectiveness of conventional and other water and waste water treatment processes; and establishing health guidelines for re-use of waste water and for the improvement of national drinking water supplies and of water-pollution control programmes.

## B. Food control

172. FOOD CONTAMINATION IS A MATTER OF WIDE CONCERN:

- food, like drinking water and air, can be the carrier of contaminants that directly affect human health. Chemicals and other agents may contaminate food at any stage from production to consumption. They may reach food through complex environmental pathways along which they undergo significant concentration;
- the risk of widespread contamination of the environment has magnified the problems of food contamination that are now common to an increasing number of countries;
- existing measures and facilities cannot cope with this new dimension. In many countries, existing control policies, including legislation and the means of enforcing it, are inadequate.

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[1] The subject of water quality is treated extensively in subject area II, Environmental aspects of natural resources management, Section F, and related recommendations.

173. THE FOLLOWING ACTIONS ARE NEEDED AT NATIONAL AND INTERNATIONAL LEVEL:[1]

- further development of programmes for prevention and control of food contamination at all stages from production to consumption;
- research on methods of detection, prevention and removal of environmental contamination of food;
- establishment of an international monitoring and early warning system.

174. INTERNATIONAL, AND OFTEN NATIONAL, PROGRAMMES FOR THE PREVENTION AND CONTROL OF FOOD CONTAMINATION NEED STRENGTHENING.

A food quality protection programme should be based on derived food standards backed up by effective measures of control and implementation, specifically:

- prevention of food contamination. Comprehensive national food contamination prevention programmes are needed. They should include education of the general consumer public, and training of food producers, handlers and manufacturers in the control of chemical and biological contamination of foodstuffs. Such programmes should include proper inspection of food-processing plants and abattoirs, the latter in co-operation with the livestock disease control authorities;
- development of legislation and enforcement machinery. To supplement preventive and control measures, countries should develop effective food control laws and enforcement machinery;
    - . legislative measures directly or indirectly related to food quality control should be subject to review and revision; they include supplementary legislation for the use of pesticides, sewage disposal, release of industrial wastes, and the handling and storage of toxic substances

      an adequate administrative framework for the implementation of control programmes is essential.
- the establishment of monitoring networks to check compliance with regulations and standards. This involves the collection, collation, analysis and storage of data, especially on
    - . micro-organisms and parasitic agents

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[1] See also paragraphs 141-143 for reference to the works of the Codex Alimentarius Commission.

  - additives and contaminants in foodstuffs
  - potentially hazardous components such as methyl-mercury, lead, cadmium and persistent organo-chlorine compounds, including PCBs.

175. RESEARCH IS NEEDED TO INCREASE THE EFFECTIVENESS OF NATIONAL AND INTERNATIONAL EFFORTS TO PREVENT AND CONTROL FOOD CONTAMINATION:

- research is particularly required in the following areas:
  - development of simple, standardized and more sensitive methods to detect residues and contaminants in food, particularly those of natural origin such as marine and fungal biotoxins
  - development of processing methods that will destroy or remove toxic contaminants while maintaining the acceptability of foods;
- knowledge of the toxicology, characteristics and intakes of contaminants as the basis for establishing primary protection standards and derived working levels should be expanded;
- standardized and comparable methods for sampling and measuring food contaminants should be developed in order to facilitate the comparison of results.

176. NATIONAL PROGRAMMES NEED INTERNATIONAL EXCHANGE OF INFORMATION AND EXPERIENCE:

- the existing international systems for the collection, retrieval, evaluation and dissemination of information on food contamination control should be strengthened to assist developing countries in setting up effective food control programmes including the adoption of standards and of food legislation;
  - international assistance should be made available to provide national institutions with staff and equipment that facilitate the participation of countries in information exchange programmes.

177. AN INTERNATIONAL MONITORING AND DATA RETRIEVAL PROGRAMME SHOULD BE SET TO FACILITATE THE ACQUISITION AND EXCHANGE OF INFORMATION IN THIS FIELD.

The programme would centralize national information on food contamination (including the results of relevant research) and keep national authorities apprised of developments so that they could take corrective action before a problem caused by environmental pollutants reached major proportions.

- the programme should collect, collate and evaluate data on food contamination with emphasis on trends in environmental pollutant levels. The data to be collected would be provided by:
  - national food contamination monitoring programmes and, where required, special surveys
  - FAO/WHO reference centres to be established or expanded for that purpose. These centres could also provide the expertise and laboratory facilities needed for regional and national surveys
  - national or international environmental monitoring programmes
  - food consumption surveys providing information on the quality of diet and the total intake of food contaminants;
- a multidisciplinary approach to the evaluation of all data is necessary.
  - the application of chemical analysis, biochemistry, and toxicology is needed for the full evaluation of the implications of certain foreign substances
  - relevant aspects of food production and food technology will also need to be evaluated
  - because expert knowledge in all these fields may not always be available nationally, the advice of expert committees convened by FAO, WHO and other relevant agencies will play an increasing role and these committees should be strengthened accordingly;
- the results of the evaluation will need to be speedily disseminated to national authorities to reinforce programmes for the prevention and control of food contamination.

## C. Air and climate

### (i) Air quality in urban and industrial areas

178. NATIONAL PROGRAMMES FOR AIR QUALITY CONTROL are needed which take the following factors into account:

- present and future development of industries, energy production and urbanization;
- fuel policy and transport plans;
- the cost/effectiveness of alternative means of pollution prevention and abatement available to meet national air quality objectives.

179. AIR QUALITY MANAGEMENT PROGRAMMES should include the following measures:

- assessment of air quality and quantitative knowledge of major pollution sources, of trends and fluctuations in air pollution and of air pollution effects are a basis for establishing national air quality standards and control programmes. This knowledge is obtained by:
  - . preparing inventories of air pollution sources to identify priorities for control problems
  - . carrying out ad hoc surveys of air quality in urban and industrial areas as a basis for planning and establishing air pollution monitoring networks and early-warning systems
  - . assessing the risks to population through air quality monitoring, air pollution forecasting and medical supervision of sensitive population groups
  - . evaluating the effects of air pollution on the environment and assessing their economic implications;
- incorporation of air pollution control techniques and procedures in all new industrial or power production projects;
- development of rational siting and zoning policies;
- establishment of legislation and enforcement machinery, which will form part of the general national pollution control legislation;
- establishment of local, especially urban, air monitoring networks, to serve these objectives. In addition to relevant meteorological and other observations, priority should be given to specific pollutants according to local conditions, including:
  - . oxides of sulphur
  - . particulate matter
  - . carbon monoxide
  - . oxides of nitrogen
  - . oxidants
  - . lead

180. AIR POLLUTION IS INCREASINGLY A REGIONAL PROBLEM

- regional co-operation is therefore needed in monitoring and assessing air pollution by such agents as sulphur dioxide in certain parts of the world[1/];
- consultation mechanisms for speedy implementation of concerted abatement programmes should be established as a matter of urgency.

181. INTERNATIONAL SUPPORT FOR NATIONAL ACTION may be needed in the following areas:

- exchange, evaluation and dissemination of information. To assist in developing balanced air pollution control programmes, and to provide a basis for establishing air quality criteria and standards, the existing international systems for the collection, retrieval, evaluation and dissemination of information on air pollution in urban and industrial areas should be improved and expanded;
  - . Information systems should include data on:
    - .. levels and trends of air pollution and their relation to meteorological factors
    - .. effects of air pollution on health
    - .. other environmental effects of air pollution
    - .. national air quality standards and legislation
    - .. control practices
    - .. advances in air pollution control technology
  - . a network of international and national reference centres and collaborating laboratories is needed to serve as a basis for such action and should be developed to include adequate facilities for the analysis and dissemination of information
  - . certain national institutions may need to be strengthened so that they are suitably staffed and equipped to participate in information exchange programmes
  - . to make data exchange possible, compatible methods for sampling and measuring air pollutant concentrations and for identifying and measuring human responses and the effects of air pollutants on the environment must be developed;

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[1/] See for instance the Swedish case study "Air Pollution across national boundaries".

- training of personnel in air pollution control. Lack of trained personnel at all levels of professional competence is one of the main obstacles to developing and implementing air pollution control programmes. International training programmes should include:
  - individual fellowships
  - international or regional training courses and seminars
  - assistance to governments in setting up national training programmes and institutions ;
- international collaborative research. Serious efforts are needed both at national and international levels to intensify and expand research programmes related to air pollution, and the technology for its control (such as the development of low cost methods for the production of smokeless fuels),
  - advances in control technology to reduce $SO_2$ and other emissions from the combustion of coal and oil are needed in the face of widespread reliance on these fuels to meet increased demands for electricity.

(ii) Man's impact on climate

182. THERE ARE MAJOR GAPS IN OUR UNDERSTANDING OF THE FACTORS THAT DETERMINE CLIMATE AND ITS FLUCTUATIONS

The Global Atmosphere Research Programme (GARP) will develop much but not all of the information needed. Although progress has been made in the development of theories, models and techniques for determining the impact of human activity on climate, improvement in our knowledge of climatic variables requires action of two kinds:

- research on and modelling of climatic phenomena;
- monitoring in critical areas to supplement available observational data.

183. RESEARCH ON CLIMATIC PHENOMENA is essential if we are to avoid significant modifications in the Earth's climate.

- climatic fluctuations from natural causes should be reviewed, insofar as possible, with particular emphasis on:
  - multidisciplinary studies of past climates, particularly in epochs when the Arctic Ocean was free of ice
  - studies relating past climatic conditions to simultaneous atmospheric circulation patterns;

- influence of human activities on local and regional climates: Research should be undertaken on climate modifications that may result from the changes man makes in the landscape: specifically,
  - . studies of the influence of cities on climate, in particular of cities covering large areas
  - . model experiments to reveal the consequences of altering by irrigation and other processes the heat balance at the surface, for example in marginal semi-arid regions
  - . studies of the effects of overgrazing by domestic livestock combined with excessive use of groundwater resources, with special emphasis on the risk of creating man-made deserts
  - . development of standardized methods for computing on a seasonal basis averages of surface temperature, precipitation and radiation
  - . studies of the side effects of weather-modification activities on local and regional climates;
- the influence of human activities on the global climate. Studies should be made of the ways in which human activities may be influencing the interconnected processes that determine the radiation balance. These studies should include:
  - . development of mathematical models, particularly:
    - .. simplified climatic models, in order to gain insight into some of the basic factors of climate and climate change
    - .. more refined mathematical models of the atmosphere to determine the long-term effects of atmospheric $CO_2$ and particulate matter and of changes in land use. Such models should also help make it possible to forecast natural disasters[1]
    - .. new and improved joint atmosphere-ocean models that incorporate the effects of $CO_2$, cloudiness, sea ice, snow cover, sea-air interface exchange of heat, moisture and particulate matter in the atmosphere
  - . studies of the direct influence of particles and $CO_2$ on the atmosphere; radiation fields of short-wave and long-wave radiation in clean and

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[1] See in this connexion the section on natural disasters in subject area I, Planning and management of human settlements for environmental quality (A/Conf.48/6)

polluted atmosphere; refractive index of particles; changes of the albedo of the globe caused by air pollution; changes in cloud cover, water content, and precipitation caused by pollution, and other effects related to changing land-use practices and associated natural variation

censuses of variables that are relevant to studies of climate and of man's impact on it but do not require continued monitoring. Data should be representative of large areas of the Earth and could be checked at intervals of 1-10 years. The following groups of variables should be considered:

.. those describing the state of the climate: arctic ice cover, glacier mass, sea level, etc.

.. those describing man's impact: surface of irrigated areas, of artificial lakes and of urban areas, fuel consumption, cloud seeding activities, etc.

- dispersion and transformation of atmospheric pollutants. Detailed studies should be undertaken of the distribution of particulate matter in the atmosphere and the processes of dispersion and transformation, specifically:
  - studies of the chemical transformation of pollutants
  - studies of the mechanisms whereby gases and particulate matter are distributed in and removed from the atmosphere
  - research on the stratospheric transport and distribution of ozone and other trace gases as well as on the role of water vapour in the stratosphere and on the possible effect of its increase as a result of high flying aircraft. Both chemical reactions and transport processes must be incorporated in realistic models to resolve uncertainties in the prediction of effects of constituent changes
  - studies of dispersion theory and development of mathematical models for distribution of pollutants in industrialized areas;
- measuring techniques for atmospheric research and the use of sensors. Support of programmes to develop instrumentation and measuring techniques needed to acquire the data necessary for specialized atmospheric research and the assessment of natural and man-made atmospheric changes

- . sensors are especially needed for monitoring, at least to 30 km above the earth's surface, various gaseous constituents of the atmosphere and determining the size distribution, concentration, chemical composition and optical characteristics of particles
  - .. many of these observations could be carried out from satellites by means of remote sensing.

184. MONITORING is a necessary adjunct to the research activities indicated above. An extensive network of atmospheric monitoring stations will be required as a supporting system of the WWW and should include:

- monitoring of the solar constant by satellites;
- approximately ten baseline stations, in areas remote from all sources of pollution, to monitor long-term global trends in atmospheric constituents and properties which may produce changes in the climate. For assessing secular changes of the global climate, these stations will need especially to monitor variables such as:
  - . atmospheric turbidity (aerosol content)
  - . atmospheric carbon dioxide
  - . solar radiation
  - . vertical distribution of aerosols
  - . size distribution of aerosols
  - . surface vertical fluxes of carbon dioxide
  - . ozone, water vapour and trace gases in the stratosphere
  - . standard meteorological variables;
- a much larger network of (not less than 100) stations for monitoring regional air quality, especially changes in the distribution and concentration of contaminants on a regional basis;
  - . the siting of these stations should be representative of integrated regions which may be defined on the basis of geography, biota, climate, land-use, etc
  - . precipitation samples should be collected and analyzed for a number of significant organic and inorganic compounds of both man-made and natural origin

- the variables to be monitored at baseline stations may also be monitored at regional stations:
  - it should be possible for such regional stations to use less sophisticated instrumentation so that countries with modest resources can participate
- in view of the meteorological and climatological aspects, guidance on how and where to establish network stations should be sought from WMO
- advantage could be taken of the existing network of stations participating in the IAEA/WMO joint programme of tritium, deuterium and oxygen-18 measurements in precipitation.

## D. Terrestrial ecology

### (i) The need for ecological research

185. AN ACCURATE EVALUATION OF THE IMPACT OF POLLUTANTS ON ECOSYSTEMS is at present impossible because of the lack of knowledge of the structure and functioning of the biosphere.

- the overall effects of changes in distribution and abundance of pollutants have not been fully determined on either the structure and functioning of ecosystems or on the environment as a whole;
- it is known that the appearance in the environment of new compounds, and changes in the amounts, distribution and concentrations of naturally occurring compounds have had an adverse impact on a number of animal and plant populations by increasing mortality or impairing reproduction. As a result, the population structure of certain species is being disrupted and ecological balance is being upset.

### (ii) Action required

186. RESEARCH IS NEEDED IN THE FOLLOWING AREAS:

- identification of pollutant substances that are potentially significant in terms of their ecological impacts;
- determination of the routes and concentrations of these pollutants;
- determination of their effects on ecosystems and ecosystem components.

### (iii) Identification of pollutants

187. THE FOLLOWING KINDS OF INFORMATION ARE NEEDED for the identification of pollutants that are likely to be significant and widespread:

- production and distribution figures. Reliable data are needed on imputs of potentially pollutant chemical substances into the global ecosystem.
    - . the requisite figures are difficult to obtain, since they tend to be privileged national and industrial information
        - .. an important step being considered by IAEA and WHO is the international register of significant releases to the environment of radioactive wastes resulting from peaceful uses of atomic energy
    - . studies of inputs and outputs of selected substances on the regional or ecosystem scale are needed, as are improved methods for identifying industrial effluents;
- data on acute toxicity. Knowledge is needed about the toxic effects of various substances on selected species of animals and plants:
    - . some knowledge has been gained of the acute toxicity of some substances
    - . little is known of long-term effects of continued exposure, especially to low dose levels of mixtures of pollutants;
- Persistence. An important characteristic of a pollutant is its persistence in an environmental medium (air, water, soil) or in living tissue;
    - . substances that persist in a toxic form, such as certain heavy-metal metabolites, organo-chlorine compounds and PCBs are particularly hazardous;
- synergistic effects. Information is needed regarding the nature and likelihood of synergistic effects between pollutants.

### (iv) Determination of pollutant movement, transport and behaviour

188. THE NATURE OF THE TRANSFER AND INTERCHANGE OF POLLUTANTS between air, water and soil must be more clearly understood.

- quantitative information is needed on:
    - . the routes and rates of transfer of different pollutants in different environmental media
    - . reservoirs of pollutants. Different components of ecosystems absorb, store, detoxify and release pollutants in different ways and at different rates

        .. many organisms accumulate certain pollutants, which build up to toxic levels during a single life span. Pollutants may also be concentrated sequentially at successive links in a food chain;

    . changes in the routes and rates of transport of pollutants:

        .. attention must be focused on pathways with the highest rates of transfer of toxic pollutants to targets that are of critical importance to the stability of ecosystems;

- an integrated approach, which runs across traditional academic and professional lines of specialization must be taken in the acquisition of this information:

    . specialization is necessary for the detailed measurement and investigation of pollution transport, but is inadequate for the assessment of global trends

    . it is therefore important to use multidisciplinary approaches and to take into account pertinent interrelationships of all segments of the environment when tracing the movement of pollutants;

- procedures are needed for comparison of analytical methodologies used in different laboratories in different countries;
- examinations of the record of past life forms (in sediments and pollen deposits, of longlived forms (in tree rings) and of museum specimens of existing species may yield data on previous environmental conditions and thus help establish levels of polluting substances that can be considered "natural".

(v) Determination of effects of pollutants

189. EFFECTS OF DIFFERENT LEVELS OF SPECIFIC POLLUTANTS and especially of the aggregate impact of all pollutants on the biosphere need to be documented.

- interaction between pollutants appears to be the rule rather than the exception. For this reason the combined effects of a large number of pollutants, each in small concentrations, can be greater than the effect of a major pollutant, or can differ markedly from the effect of any single minor component;

    . the determination of such effects requires broad geographical studies, long-term toxicity testing in different parts of the biosphere, the use of biological monitoring and the evaluation of such manifestations as the reproductive success of selected species.

(vi) Monitoring

190. MONITORING ACTIVITIES AT NATIONAL, INTERGOVERNMENTAL AND INTERNATIONAL LEVELS need to be improved, co-ordinated and amplified. National facilities should be developed to serve as central data-processing and storage centres, and efficient referral systems for the exchange of information should be established.

- critical chemicals. The environment levels of potentially toxic substances can be monitored by sampling biological and abiotic materials that tend to accumulate these substances;
    - of special interest are particularly hazardous compounds such as mercury, lead cadmium, and organo-chlorine compounds, including PCBs
- biological indicators. Organisms that are sensitive to pollutants can give information about changes in levels of certain pollutants;
    - such organisms reflect the presence of particular pollutants, indicating pathways and points of accumulation and revealing rates of change in pollutant levels;
- animal and plant populations. Sudden changes in the populations of sensitive species, particularly of predators at the end of food chains, are often the first indication of a potentially hazardous environmental situation.

191. EXISTING UNITED NATIONS AGENCIES AND PROGRAMMES CAN PROVIDE STIMULUS AND ASSISTANCE FOR NATIONAL RESEARCH AND MONITORING ACTIVITIES

- the effects of pollutants on ecosystems as well as their transport through ecosystems is the subject of study under a number of programmes co-ordinated and supported by agencies of the United Nations;
- the Man and the Biosphere Programme provides a framework for organizing and co-ordinating a number of needed research efforts. It contains provisions for co-ordination of studies on the pollutant effects on terrestrial organisms and on the identification of biological indicators and plays a role in the promotion of intensive ecosystem analyses and of extensive surveys of selected species.

## Chapter VIII

## A COMPREHENSIVE APPROACH TO THE PROBLEM OF MARINE POLLUTION

192. THE OCEAN AND THE LIVING ORGANISMS IT SUPPORTS ARE VITAL TO HUMANITY:

- the capacity of the sea to assimilate agents released into it is great, but finite. When this capacity is exceeded in a part of the ocean, environmental deterioration can be rapid and severe. Reversing these trends may take a long time or even be impossible. Effects of ocean changes on climate and on the hydrological cycle are a matter of concern;
- serious degradation has already occurred in many estuaries, in coastal regions, throughout entire enclosed seas and threatens areas of the open oceans. It has directly affected man's health, the living resources of the sea, amenities, maritime activities, and other uses of the sea.

193. THE INTRODUCTION OF INCREASING AMOUNTS AND VARIETIES OF POLLUTANTS INTO THE MARINE ENVIRONMENT IS A MATTER OF GRAVE CONCERN TO ALL:

- the oceans are of use to all mankind, and pollutants entering the oceans in one area may have undesirable effects far from where they enter;
- coastal nations have a particular interest in and responsibility for these matters, but because most marine pollution arises from polluting activities on land, often far from the sea, all States should be involved in a common effort to manage the marine environment so as to preserve its quality and conserve its resources.

194. A COMPREHENSIVE APPROACH TO THE PROBLEM OF MARINE POLLUTION REQUIRES TWO MAIN CATEGORIES OF ACTION:

- assessment, which includes:
  - . identification of high priority pollutants, their sources and pathways to the sea, and evaluation of the risks they pose
  - . basic research
  - . monitoring
  - . collection, storage, retrieval and dissemination of information

- control, which includes measures to establish maximum acceptable levels of pollutants, to limit their discharge, and to check on, promote and enforce compliance;
  - . such measures may be formulated as recommendations or guidelines, or as legally binding obligations;
- it is important to recognize that control and assessment are mutually dependent activities. For example, research helps to identify problems for which control is needed; monitoring may be used to check on the effectiveness of control measures.

195. BOTH ASSESSMENT AND CONTROL WILL BE OF CONCERN AT THE NATIONAL AND INTERNATIONAL LEVELS:

- research and monitoring in various national contexts may benefit from international exchange and from joint programmes;
- the implementation of control will occur at the national level since virtually all sources of marine pollution are subject to national jurisdictions, but international harmonization of national measures, whether globally or regionally, will increase their effectiveness in many cases;
- special provisions should be made for the participation of developing countries in these activities.

196. A COMPREHENSIVE APPROACH THEREFORE DEPENDS LARGELY ON NATIONAL EFFORTS:

- a few specific international measures are required to control certain pollutants and practices and to prepare the framework for the assumption by by States of joint responsibilities;
- the elaboration of a body of law to prevent and control marine pollution resulting from man's maritime activities has been underway for some time. It will continue in 1973 at the IMCO Conference on Marine Pollution and at the Law of the Sea Conference, also scheduled to begin in 1973.

## A General principles

197. A SET OF GENERAL PRINCIPLES FOR ASSESSMENT AND CONTROL OF MARINE POLLUTION SHOULD BE ACCEPTED AND ENDORSED BY GOVERNMENTS:

- the definition of marine pollution employed by the United Nations is:
  - . "the introduction by man, directly or indirectly, of substances or energy into the marine environment (including estuaries) resulting in such deleterious effects as harm to living resources, hazards to human health,

hindrance to marine activities including fishing, impairment of quality for use of sea water, and reduction of amenities"

- the following principles were suggested by the Intergovernmental Working Group on Marine Pollution (November 1971) as guiding concepts representing a basis for general agreement:

(1) Every State has a duty to protect and preserve the marine environment and, in particular, to prevent pollution that may affect areas where an internationally shared resource is located.

(2) Every State should adopt appropriate measures for the prevention of marine pollution, whether acting individually or in conjunction with other States under agreed international arrangements.

(3) States should use the best practicable means available to them to minimize the discharge of potentially hazardous substances to the sea by all routes, including land-based sources such as rivers, outfalls and pipelines within national jurisdiction, as well as dumping by or from ships, aircraft and platforms.

(4) States should ensure that their national legislation provides adequate sanctions against those who infringe existing regulations on marine pollution.

(5) States should assume joint responsibility for the preservation of the marine environment beyond the limits of national jurisdiction.

(6) The States at higher levels of technological and scientific development should assist those nations which request it, for example by undertaking programmes either directly or through competent agencies intended to provide adequate training of the technical and scientific personnel of those countries, as well as by providing the equipment and facilities needed in areas such as research, administration, monitoring or surveillance, information, waste disposal, and others, which would improve their ability to discharge their duties consisting of protecting the marine environment.

(7) States should discharge, in accordance with the principles of international law, their obligations towards other States where damage arises from pollution caused by their own activities or by organizations or individuals under their jurisdiction and should co-operate in developing procedures for dealing with such damage and the settlement of disputes.

(8) Every State should co-operate with other States and competent international organizations with regard to the elaboration and implementation of internationally agreed rules, standards and procedures for the prevention of marine pollution on global, regional and national levels.

(9) States should join together regionally to concert their policies and adopt measures in common to prevent the pollution of the areas which, for geographical or ecological reasons, form a natural entity and an integrated whole.

(10) International guidelines and criteria should be developed, both by national Governments and through intergovernmental agencies, to provide the policy framework for control measures. A comprehensive plan for the protection of the marine environment should provide for the identification of critical pollutants and their pathways and sources, determination of exposures to these pollutants and assessment of the risks they pose, timely detection of undesirable trends, and development of detection and monitoring systems.

(11) Internationally agreed criteria and standards should provide for regional and local variations in the effects of pollution and in the evaluation of these effects. Such variables should also include the ecology of sea areas, economic and social conditions, and amenities, recreational facilities and other uses of the seas.

(12) Primary protection standards and derivedworking levels - especially codes of practice and effluent standards - may usefully be established at national levels, and in some instances, on a regional or global basis.

(13) Action to prevent and control marine pollution (particularly direct prohibitions and specific release limits) must guard against the effect of simply transferring damage or hazard from one part of the environment to another.

(14) The development and implementation of control should be sufficiently flexible to reflect increasing knowledge of the marine ecosystem, pollution effects, and improvements in technological means for pollution control and to take into account the fact that a number of new and hitherto unsuspected pollutants are bound to be brought to light.

(15) Every State should co-operate with other States and with competent international organizations with a view to the development of marine environmental research and survey programmes and systems and means for monitoring changes, in the marine environment, including studies of the present state of the oceans, the trends

of pollution effects and the exchange of data and scientific information on the marine environment. There should be similar co-operation in the exchange of technological information on means of preventing marine pollution including pollution that may arise from offshore resource exploration and exploitation.

(16) International guidelines should also be developed to facilitate comparability in methods of detection and measurement of pollutants and their effects.

(17) In addition to its responsibility for environmental protection within the limits of its territorial sea, a coastal State also has responsibility to protect adjacent areas of the environment from damage that may result from activities within its territory.

(18) Coastal States should ensure that adequate and appropriate resources are available to deal with pollution incidents resulting from the exploration and exploitation of seabed resources in areas within the limits of their national jurisdiction.

(19) States should co-operate in the appropriate international forum to ensure that activities related to the exploration and exploitation of the seabed and the ocean floor beyond the limits of national jurisdiction shall not result in pollution of the marine environment.

(20) All States should ensure that vessels under their registration comply with internationally agreed rules and standards relating to ship design and construction, operating procedures and other relevant factors. States should co-operate in the development of such rules, standards and procedures, in the appropriate international bodies.

(21) Following an accident on the high seas which may be expected to result in major deleterious consequences from pollution or threat of pollution of the sea, a coastal State facing grave and imminent danger to its coastline and related interests may take appropriate measures as may be necessary to prevent, mitigate, or eliminate such danger, in accordance with internationally agreed rules and standards.

(22) Where there is a need for action by or through international agencies for the prevention, control or study of marine pollution, existing bodies, both within and outside the United Nations system, should be utilized as far as possible.

(23) States should assist one another to the best of their ability, in action against marine pollution of whatever origin.

B. Assessment

198. EFFORTS SHOULD BE CONCENTRATED ON THE POLLUTANTS POSING THE GREATEST RISKS:

- the Joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP) has identified certain types of pollutants as requiring priority attention because they harm living resources, endanger human health, reduce amenities or interfere with other uses of the sea. These include domestic sewage, heavy metals, organo-chlorine compounds, oil, and other organic chemicals;
  - . of these, special hazards are presented by those, such as heavy metals and organo-chlorines, that are persistent as well as toxic;
- organosilicon compounds and organochalogen compounds other than organo-chlorines have also been identified as particularly hazardous to living organisms.

199. THE LIST OF HIGH PRIORITY POLLUTANTS IS NOT STATIC:

- systems should be devised for continual appraisal and reporting of pollutants thought to pose particularly high risks;
- research and monitoring as outlined below will contribute to the identification of new pollutants, but information is also needed on the amounts of toxic and persistent substances that are being produced since many of these eventually reach the sea.

200. THE RISKS, PATHWAYS AND SOURCES OF HIGH PRIORITY POLLUTANTS SHOULD BE QUANTITATIVELY ASSESSED:

- risks may occur to human health, living resources of the sea, amenities maritime activities and various other uses of the sea; the assessment of the expected frequency and magnitude of these effects at various levels of exposure to a pollutant will provide guidance in determining the need for control;
- pathways include the routes of entry of pollutants into the marine environment as well as their transfer via physical, chemical and biological processes within the marine environment; the assessment of which of these pathways are more important in determining exposures will help to identify important sources;

- routes of entry into the marine environment may include direct outfalls into the sea from maritime activities or coastal facilities, entry via rivers and estuaries and entry via the atmosphere
- transfers in the marine environment may include dispersion in water and movement in currents as well as accumulation in sediments and in food chains;

- sources may include both maritime and land-based activities; assessing which of these are most important for a given pollutant will provide guidance in achieving effective control;
  - maritime sources may include accidental or intentional releases from ships and from various uses of the sea floor
  - land-based sources may include industrial, agricultural and waste-disposal activities, in many of which there is no intention of discharging pollutants to the marine environment;
- as a step towards quantitative assessments, GESAMP should re-examine annually, and revise as necessary, its Review of Harmful Chemical Substances, with a view towards elaborating further its qualitative assessment of risks, pathways and sources.

201. THERE IS A NEED FOR RESEARCH INTO ALL ASPECTS OF MARINE POLLUTION IN ORDER TO PROVIDE A BASIS FOR ASSESSING RISKS, PATHWAYS AND SOURCES:

- certain areas of research requiring priority attention to develop quantitative understanding of pollution problems are given in Annex I to this chapter. They include:
  - the toxicity, including sub-lethal effects, of various pollutants and combinations of pollutants on a variety of species
  - the structure of marine biological communities, in particular tropical communities, and those in special habitats such as lagoons, coral reefs and mangrove swamps
  - dynamics of ecosystems, including pathways of pollutants in and among sea water, sediments and marine organisms
  - routes of entry of pollutants into the marine environment, particularly rivers and the atmosphere, and prediction of dispersion by wind, tides and currents

. improved monitoring techniques, particularly methods of measurement and analysis and intercomparison of results.

202. IN THESE AREAS AND OTHERS IT IS POSSIBLE TO SUGGEST THAT CERTAIN RESEARCH TASKS SHOULD BE PERFORMED:

- methods of using world statistics on mining, production, industrial use, processing and transport of substances that may become high priority marine pollutants to identify sources and emissions should be developed;
- expert groups should propose guidelines for test programmes to evaluate toxicity and prepare initial lists of biological risks to guide States in the regulation of ocean dumping;
- FAO and WHO should encourage and support studies of toxicity to man and to marine organisms;
- the Intergovernmental Oceanographic Commission (IOC)[1], with the co-operation of FAO, should encourage and support ecosystem studies with emphasis on evaluating chronic, low-dose effects of high priority pollutants on marine organisms;
- IOC, with FAO and WHO, should explore the possibility of developing an international institute for tropical marine studies, which would undertake education and training as well as research;
- the IAEA should encourage and support studies on the behaviour and effects of radionuclides and other pollutants in the marine environment.

203. THERE IS ALSO A NEED FOR MONITORING TO PROVIDE DATA ON EXPOSURES, RISKS, PATHWAYS AND SOURCES:

- this requires continued observation, measurement and evaluation of selected characteristics of the marine environment, of concentrations of pollutants within it and of certain of its organisms;

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[1] Throughout this chapter, IOC is referred to as a specialized mechanism supported by organizations whose executive heads participate in the Inter-Secretariat Committee on Scientific Problems Relating to Oceanography (ICSPRO) (UNESCO, FAO, WHO, IMCO, UN).

- monitoring programmes should take note of the following needs:
  - determination of effects of pollutants on marine organisms
  - establishment of present-day baselines, or "normal" conditions, and detection of variations from those baselines
  - establishing the record of past exposures to pollutants
  - measurement of inputs of pollutants to the sea by coastal outfalls, land run-off, rivers and the atmosphere
  - detection of new pollutants
  - the gathering, consolidation and broad dissemination of data to both researchers and those responsible for policy decisions
  - provision for training of scientists and technicians from developing countries to encourage their active participation.

204. MARINE MONITORING PROGRAMMES SHOULD BE SELECTIVE:

- careful consideration is required concerning locations for monitoring efforts, the part of the ecosystem to be sampled (water, sediments, biota, etc.), pollutant substances to be measured and techniques for measurement;
- the same analytical techniques need not always be used, but techniques should be compatible;
- in principle, first priority should be given to pollutants that pose the highest risks;
- organisms should be selected that concentrate or integrate pollutants. Some especially sensitive species can serve as early-warning systems;
  - the identification of such species, and other refinements of monitoring systems, must be based on research, as outlined in the GIPME report.[1]

205. TO BE EFFECTIVE, MARINE MONITORING SYSTEMS REQUIRE CONTINUING SUPPORT:

- requirements have been considered by the Intergovernmental Working Group on Monitoring or Surveillance and continue to be studied under the auspices of the IOC;
- a monitoring system could be developed within the Integrated Global Ocean Station System (IGOSS) being prepared by IOC jointly with WMO. The

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[1] See Annex of this chapter.

development of GIPME as the major component of the Long-term and Expanded Programme of Ocean Exploration and Research (LEPOR), co-ordinated by IOC, will further the elaboration of such a system;

- on the basis of certain organizations' capabilities, interests and present activities, it is advisable that:
    - IOC support the development of methods for monitoring high priority pollutants in water, sediments and organisms, with advice from GESAMP on standard methodologies
    - IOC, with the assistance of WHO and FAO, promote the organization of co-operating laboratories into regional and ultimately global networks for monitoring marine pollution
    - IOC and FAO consider the need for expansion of existing data centers
    - IOC, with WHO and WMO, consider organizing a multi-disciplinary study of river inputs of pollutants into the oceans, utilizing as appropriate the capabilities of the International Hydrological Decade (IHD)
    - IAEA should continue its activities in development of reference methods for radionuclide analyses in marine samples, including the providing of samples for intercomparison of analytical results between interested laboratories.

206. SYSTEMS SHOULD BE DEVELOPED FOR THE COLLECTION, STORAGE, RETRIEVAL AND DISSEMINATION OF INFORMATION:

- results of research on new pollutants and reports from monitoring stations are among the data requiring collection, evaluation and dissemination;
- identification of major sources of pollution requires the accumulation of statistical data and its evaluation;
- statistics on fish production and regional populations, already being collected by FAO on a world-wide basis and by fisheries commissions provide information on changes in the environment;
- a special objective of any information-handling system should be the diffusion of information on the risks, pathways and sources of marine pollutants and on control of both maritime and land-based sources to developing countries;

207. A NUMBER OF CONCEPTS AND MECHANISMS FOR HANDLING THE FLOW OF INFORMATION ON MARINE POLLUTION HAVE BEEN ADVANCED:

- the FAO Information System on Aquatic Sciences, the FAO Fisheries Data Center, the Joint WHO/FAO International Reference Center on Marine Biotoxins, the World Data Centers (Oceanography) and the network of national and regional data centres co-ordinated by IOC are all examples that may prove useful;
- on the basis of past experience with oceanographic data centers, a "referral system" may be the most practical type of servic e that international organizations can offer.

C. Control

208. CONTROL OF MARINE POLLUTION REQUIRES ACTION BOTH WITH REGARD TO MARITIME ACTIVITIES AND WITH REGARD TO MAN'S ACTIVITIES ON LAND:

- maritime activities are usually among the most readily perceived sources of marine pollution, but land-based activities often contribute significant amounts and are likely to be the critical sources for many pollutants found in the marine environment;
- in terms of undesirable effects, whether a pollutant arises initially from land-based or from maritime activities makes little difference; for practical reasons different approaches must be taken to the control of these different types of sources.

209. WITH REGARD TO MARITIME ACTIVITIES. A NUMBER OF CONTROL MEASURES HAVE ALREADY BEEN TAKEN AT THE INTERNATIONAL LEVEL:

- general provisions of the 1958 Conventions on the Law of the Sea apply in particular to radioactive materials and oil, as well as to "other harmful agents" (article 5, paragraph 7 of the Convention on the Continental Shelf and articles 24 and 25 of the Convention on the High Seas);
- the deliberate discharge of oil from ships has been limited by the 1954 Convention on the Pollution of the Sea by Oil (as amended in 1962), and will be further reduced if the 1969 amendments come into force; if they come into force, the 1969 Conventions relating to Intervention on the High Seas in

Cases of Oil Pollution Casualties and on Civil Liability for Oil Pollution Damage will contribute primarily to the prevention of accidental oil pollution and the 1971 amendments to the 1954 Convention will reduce oil spillages in an accident;

- pollution by radioactive wastes dumped in the oceans has been the subject of a number of guides and recommendations promulgated by the IAEA in accordance with a resolution of the 1958 Law of the Sea Conference and IAEA has a registry of significant amounts of radioactive wastes discharged into the oceans.
- accidental pollution by radioactive materials is dealt with by the 1960 Convention on Third Party Liability in the Field of Nuclear Energy and the IAEA Regulations for the Safe Transport of Radioactive Materials;
- the 1960 Convention for the Safety of Life at Sea, together with the supplementary codes and recommendations adopted by IMCO, such as the International Maritime Dangerous Goods Code and the Code for Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk and the Traffic Separation Schemes, also contribute to the prevention of accidental pollution from ships.

210. THERE ARE, HOWEVER, A NUMBER OF FURTHER PROBLEMS ARISING FROM MARITIME SOURCES AND ACTION IS ALREADY UNDERWAY TO DEAL WITH SOME OF THESE:

- the 1973 IMCO Conference on Marine Pollution has been called to prepare an instrument or instruments concerning
    - . complete elimination of deliberate pollution by oil from ships, with the goal of achieving this by the end of the present decade
    - . complete elimination of deliberate pollution by other noxious substances from ships
    - . design, construction and equipment of ships with a view to minimizing accidental spillages
    - . prevention of accidental pollution by noxious substances carried in containers
    - . disposal of ship-generated sewage and garbage;

- IAEA is expanding its registry of significant quantities of radioactive wastes to include all types of releases and is studying the feasibility of establishing sites for the disposal of radioactive wastes in the future.
- ocean dumping (the deliberate disposal of wastes at sea by vessels carrying wastes from land) is the subject of a draft convention for the North-east Atlantic area agreed among a number of Western European States and various proposals for a wider convention have been put forward;
  - it has been suggested in this connexion that global and regional instruments should be viewed as complementary, with global action used to link together and to complement regional initiatives
  - care must be taken in any conventions on ocean dumping to avoid conflict with existing conventions on the discharge of oil and other noxious substances from ships;
- control of pollution arising from all uses of the seabed and ocean floor beyond the limits of national jurisdiction will be dealt with at the Law of the Sea Conference scheduled to begin in 1973, although it is not yet clear whether this Conference will deal as well with pollution from use of the sea floor within national jurisdictions.

211. THERE IS AT PRESENT A NEED FOR ACCELERATION OF SOME OF THESE ACTIVITIES AND FOR INCREASING THEIR EFFECTIVENESS:

- the acceptance and implementation by governments of existing instruments should be encouraged. Governments should intensify their efforts to ensure that the provisions of existing instruments are complied with in respect of activities under their jurisdiction, in particular by ships flying their flags;
- the widest participation in the Law of the Sea Conference and the IMCO Conference on Marine Pollution should be encouraged and States preparing the Law of the Sea Conference should define its scope clearly;
- co-operation with the voluntary registration of the disposal of radioactive waste by IAEA should be widened;
- an over-all instrument for the control of ocean dumping should be completed and brought into force as soon as possible, and further regional arrangements should also be elaborated as appropriate;

- additional provisions should be made to enable developing countries to accept existing international controls and to enable international organizations to assist States in taking effective action to prevent damage to their coasts;
- more adequate provisions should be made for reviewing the effectiveness of existing and proposed measures and for revising them as the need arises.

212. WITH REGARD TO THE SOURCES OF MARINE POLLUTION THAT LIE ON LAND, THE FIRST NEED IS THAT THE IMPORTANCE OF THESE BE RECOGNIZED:

- many of the high priority marine pollutants have their major sources on land and reach the oceans via direct outfalls and run-off, via rivers and via the atmosphere;
- in many States, these land-based sources have not yet been adequately controlled.

213. THE CONTROL OF THESE LAND-BASED SOURCES IS PRIMARILY A MATTER FOR NATIONAL ACTION:

- a variety of measures will be needed, including standards, monitoring, provision of adequate treatment facilities, recycling of materials and establishment of clear responsibilities for marine pollution control;
- these measures will have to be undertaken in the light of national priorities, with due attention paid to needs for social and economic development;
- governments should be encouraged to take needed measures and international organizations should be encouraged to provide developing countries with assistance in this regard.

214. IN SOME CASES, THE EFFECTIVENESS OF NATIONAL ACTIONS MAY BE INCREASED BY INTERNATIONAL CO-OPERATION:

- pollutants from land-based sources often have effects far beyond the areas in which they are released to the environment;
- even when the effects are largely local, the sharing of experiences with national actions and the development of international guidelines for these may be useful.

215. INTERNATIONAL CO-OPERATION TO CONTROL LAND-BASED SOURCES OF MARINE POLLUTION MAY BEST BE SERVED AT PRESENT BY INCREASED EMPHASIS ON REGIONAL AGREEMENTS:

- because of the severity of marine pollution in enclosed and semi-enclosed seas, special emphasis should be placed on co-operation among States bordering these;

- the ECE and other regional organizations have already started studies of regional marine pollution problems;
- regional co-operation may include provisions for joint limitation of the discharge of specific pollutants, registering of waste disposal, standardized methods of handling and disposing of potential pollutants and agreed maximum acceptable levels of pollutants as well as scientific and technical co-operation and exchange of information on control methods.

216. IN ORDER TO ASSIST STATES IN CONTROLLING LAND-BASED SOURCES OF MARINE POLLUTION, A MECHANISM TO DEVELOP INTERNATIONAL GUIDELINES IS NEEDED:

- competent international organizations should provide governments with such guidelines as the need arises;
- in addition, the responsibility for assuring that needed guidelines of this type are provided to governments should be clearly defined.

217. IN ORDER TO PROVIDE CLEAR GOALS FOR ACTION TO CONTROL BOTH MARITIME AND LAND-BASED SOURCES, THERE IS IN SOME CASES A NEED FOR DERIVED WORKING LIMITS:

- these state the maximum acceptable level of a pollutant in a specified medium under specified circumstances;
- these limits should ultimately be based on assessments of exposures and risks for a given target, including human health, living resources, amenities and other uses of the sea, and maritime activities, with due consideration given as well to the costs of controlling sources in order that such limits be met;
- the working limits developed under the auspices of WHO and FAO for pesticide residues in fish intended for human consumption are a step in this direction;
- development of marine water quality standards in the future may be appropriate, although cases may well be recommendations of the competent international organizations with no binding force on States;
- such standards are being developed in a number of countries, and the first step should be comparison of these on the international level, and the start that GESAMP has made in this direction should be encouraged.

## ANNEX

## SUMMARY OF RECOMMENDATIONS OF THE GIPME ON MARINE POLLUTION RESEARCH

In considering the great variety of research efforts that will ultimately be required to answer the questions raised by man's increasing pollution of the ocean, the Working Group decided to identify a number of projects that should be initiated now. Some of these require elaboration by appropriate specialists, while others are ready for action by international organizations. Implementation of the proposals below, with the co-ordination of IOC, would compose the initial phase of GIPME.

The following recommendations were agreed:

1. That SCOR and ACOMR, in collaboration with the Commission on Atmospheric Chemistry and Radioactivity (of IAMAP)[1/] evaluate the problems involved in studying the transport of pollutants through the atmosphere and their transfer to the ocean, including the development of suitable sampling methods, and consider means for promoting their investigation, with the goal of achieving the capability of conducting a multiship observational programme by 1974.
2. That IOC consider the desirability and method of organizing an international multidisciplinary study of River Inputs to Ocean Systems (RIOS) and that as an initial step the IOC Secretariat compile an inventory of present national and international programmes of river discharge study and measurement, including the monitoring of river-borne pollutants.
3. That SCOR, in co-operation with other interested scientific groups, examine the possibility of designing critical experiments to evaluate the rate and extent of vertical transfer of materials across the thermocline by physical and biological processes.
4. That SCOR and ACMRR, in co-operation with other interested scientific groups, evaluate further the concept and design of a comprehensive investigation into the dynamics of ecosystems in relation to pollution, identify the methodological problems, and propose programmes for its implementation.
5. That GESAMP consider how best to promote the international exchange of information on research into the survival and fate of pathogenic bacteria and viruses in the marine environment.

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[1/] See list of abbreviations at the end of this annex.

6. That SCOPE, in co-operation with SCOR and ACMRR, be invited to arrange for consultation, co-ordination and information exchange on studies of pollutant concentrations in natural deposits and in marine and other organisms held in museum and other collections, paying particular attention to possible contamination and changes in composition with preservation and storage.
7. That ACMRR elicit, evaluate and disseminate information on biological accumulators of pollutants and encourage their use in monitoring programmes.
8. That a joint SCOR-ACMRR working group be established to review the various aspects of design and methodology in monitoring the biological effects of pollutants, to evaluate the research required to perfect methods for application in monitoring programmes, and to recommend ways whereby this research can be expedited through international co-operation.
9. That IOC encourage and co-ordinate national and regional programmes for marine pollution present state (base line) studies, giving due attention to the improvement and intercalibration of analytical methods and training in their use, and the exchange and evaluation of data and other results and information.
10. That IOC arrange now for scientists engaged in national and regional studies on present levels and/or effects of marine pollution to combine their findings in a preliminary report on the "health of the ocean".
11. That GESAMP (1) propose initial criteria to be met from the point of view of the marine environment in establishing test programmes for evaluation of product toxicity, and (2) in consultation with ICES and other appropriate bodies, prepare an initial list of biological criteria to be satisfied before approvals for ocean dumping should be issued.
12. That IOC promote the organization of networks of co-operating laboratories concerned with marine problems, on regional and subject bases, for the exchange of information, improvement and intercalibration of methods, provision of analytical services, and co-ordination of scientific effort, training and education. Regional networks should be developed within the context of regional co-operative investigations and regional organizations

where these exist. In the case of subject networks, high priority should be given to (a) laboratories concerned with determining the effects of pollutants on marine organisms, and (b) laboratories concerned with development and application of methods for determining chemical pollutants in sea water, marine organisms and sediments.

13. That IOC in the first place explore the possibility of developing in a suitable location an International Institute of Tropical Oceanography whose functions would include education and training, and marine research. The research effort should include present-state baseline studies of marine pollutants and related problems. It could also include the study of structure and process characteristic of coral reefs and lagoons, and of mangrove associations. Eventually, several laboratories of this character may be required.

### Abbreviations used in Annex I

| | |
|---|---|
| GIPME | Global investigation of pollution in the marine environment |
| SCOR | Scientific committee on oceanic research (ICSU) |
| ACOMR | Advisory committee on marine resources research |
| IAMAP | International association of meteorology and atmospheric physics |
| GESAMP | IMCO/FAO/UNESCO/WMO/WHO/IAEA/UN joint group of experts on the scientific aspects of marine pollution |
| ACMRR | Advisory committee on marine resources research |

## Chapter IX

## RECOMMENDATIONS FOR ACTION

### A. *Pollutants of international significance*

#### (i) *General recommendations*

218. *It is recommended that* Governments be especially mindful of activities in which there is an appreciable risk of effect on climate, and,

- carefully evaluate the likelihood and magnitude of climatic effects and disseminate their findings before embarking on such activities,
- consult fully other interested States when activities carrying a risk of such effects are being contemplated or implemented.

219. *It is recommended that* Governments use the best practicable means available to minimize the release to the environment of persistent and toxic substances, particularly heavy metals and organochlorine compounds, until it has been demonstrated that their release will not cause adverse effects or unless their use is essential to human health or food production, in which case appropriate control measures should be applied.

220. *It is recommended that* in establishing standards for pollutants of international significance, Governments take into account the relevant standards proposed by competent international organizations, and concert with other concerned governments and the competent international organization in planning and carrying out control programmes for pollutants distributed beyond the national jurisdiction from which they are released.

221. *It is recommended that* Governments avoid creating barriers to international trade to off-set the costs of pollution control and that they consult with other concerned governments, even though there may be no legal obligation to do so, with a view to avoiding the creation of non-tariff barriers due to variations in national standards for goods or for the transport or use of goods.1/

#### (ii) *Acquisition of knowledge*

222. *It is recommended that* Governments actively support and contribute to international programmes to acquire knowledge for the assessment of pollutant sources, pathways, exposures and risks and that those Governments in a position to do so provide educational, technical and other forms of assistance to facilitate broad participation by countries regardless of their economic or technical advancement.

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1/ This recommendation should be read in conjunction with recommendations concerning international trade relations in subject area V, development and environment.

223. It is recommended that the Secretary-General, drawing on the resources of the entire UN system, and with the active support of Governments and appropriate scientific and other international bodies;

- increase the capability of the UN system to provide awareness and advance warning of deleterious effects to human health and well-being from man-made pollutants;
- provide this information in a form which is useful to policy makers at the national level;
- develop means to assist those Governments which desire to incorporate these and other environmental factors into national planning processes.

Towards these ends, with regard to:

- DIRECT EFFECTS ON MAN

· Health

224. It is recommended that a major effort be undertaken to develop monitoring and research programmes providing data for early warning of the deleterious effects of the various environmental agents to which man is increasingly exposed, and for the quantitative assessment of their potential risks to human health. Such programmes should be guided and co-ordinated by WHO.

· Air and water

225. It is recommended that WHO, in collaboration with the relevant agencies, assist Governments, particularly those of developing countries, in undertaking biological and chemical monitoring of water and in establishing air monitoring stations in urban areas.

· Food

226. It is recommended that internationally co-ordinated programmes of research and monitoring of food contamination by chemical and biological agents be established and developed jointly by FAO and WHO and that the results of monitoring be expeditiously assembled, evaluated and made available so as to provide early warning of rises in contamination.

- INDIRECT EFFECTS

· Climate

227. It is recommended that:

- approximately ten baseline stations be set up in areas remote from all sources of pollution, to monitor long-term global trends in atmospheric constituents and properties, which may cause changes in climate;

- a much larger network of not less than one hundred stations be set up for monitoring air quality on a regional basis and especially changes in the distribution and concentration of contaminants;
- these programmes be guided and co-ordinated by the WMO;
- and, in addition, WMO, in co-operation with ICSU, continue to carry out the Global Atmospheric Research Programme (GARP), and if necessary establish new programmes, to understand better the general circulation of the atmosphere and the causes of climatic changes.

• Terrestrial ecosystems

228. It is recommended that the Secretary-General ensure that:

- research activities in terrestrial ecology be encouraged, supported and co-ordinated through the appropriate agencies, so as to gain adequate knowledge of the inputs, movements, residence times and ecological effects of pollutants identified as critical;
- regional and global networks of existing and, where necessary, new research stations, research centres, and biological reserves be designated or established within the framework of the MAB programme in all major ecological regions, to facilitate intensive analysis of the structure and functioning of ecosystems under natural or managed conditions;
- the feasibility of using stations participating in this programme for surveillance of the effects of pollutants on ecosystems be investigated,
- programmes such as MAB be used to the extent possible to monitor
  - accumulation of hazardous compounds in biological and abiotic material at representative sites
  - the effect of such accumulation on reproductive success and population size of selected species.

(iii) Control

- FOOD

229. It is recommended that increased support be given to the Codex Alimentarius Commission to develop international standards for pollutants in food and a code of ethics for international food trade.

- AIR AND WATER

230. It is recommended that the WHO, in conjunction with the appropriate UN agencies, develop derived working limits for common air and water contaminants.

### (iv) *Support*

231. *It is recommended that* Governments provide information to the Secretary-General concerning their experiences with pollution control activities, including legislative and administrative arrangements, technology, cost-benefit methodology, and that the Secretary-General make this information available to those who desire to benefit from the experience of others.

### (v) *Machinery*

232. *It is recommended that* any intergovernmental mechanism which may be established within the United Nations in connexion with environmental problems should include among its functions:

- determination of which pollution problems are of international significance;
- consideration of the appointment of appropriate intergovernmental, expert bodies to assess quantitatively the exposures, risks, pathways and sources of pollutants of international significance
- review and co-ordination of international co-operation for pollution control, ensuring in particular that needed measures are taken and that measures taken in regard to various media and sources are consistent with each other;
- examination of the needs for technical assistance to Governments in the study of pollution problems, in particular those involving international distribution of pollutants.

## B. *Marine pollution*

### (i) *General recommendations*

233. *It is recommended that* Governments:

- accept and implement existing instruments on the control of the maritime sources of marine pollution;
- ensure that the provisions of existing instruments are complied with by ships flying their flags and that adequate provisions are made for reviewing the effectiveness of, and revising, existing and proposed international measures for control of marine pollution;

4 - ensure that ocean dumping by their nationals is controlled and complete and bring into force as soon as possible an overall instrument for the control of ocean dumping, as well as needed regional agreements within the framework of this instrument;

- participate fully in the 1973 IMCO Conference on Marine Pollution and the Law of the Sea Conference scheduled to begin in 1973, as well as in regional efforts, with a view to bringing all significant sources of pollution within the marine environment under appropriate controls;
- strengthen national controls over land-based sources of marine pollution.

(ii) Acquisition of knowledge

234. It is recommended that Governments:

- support national research and monitoring efforts that contribute to agreed international programmes for research and monitoring in the marine environment, in particular GIPME and IGOSS;
- register the discharge of significant quantities of radioactive materials to the oceans with the IAEA, as well as co-operate with IAEA in the expansion of this registry to include all discharge of significant quantities of radioactive materials into the biosphere;
- provide to the UN, FAO and UNCTAD, as appropriate to the data-gathering activities of each, statistics on the production and use of toxic and persistent materials;
- expand their support to components of the United Nations system concerned with research and monitoring in the marine environment, especially the IOC in order that it can take on additional responsibilities for promotion and co-ordination of scientific services.

- ASSESSMENT

235. It is recommended that the Secretary-General, together with the sponsoring agencies, make it possible for GESAMP to:

- re-examine annually, and revise as required, its Review of Harmful Chemical Substances with a view to further elaborating its qualitative assessment of risks, pathways and sources of marine pollutants;
- assemble scientific data and develop a set of scientific considerations to be taken into account in the regulation of ocean dumping and continue its comparison of national marine water quality standards.

- RESEARCH

236. It is recommended that the Secretary-General ensure that:

- mechanisms for combining world statistics on mining, production, processing, transport and use of potential marine pollutants are developed along with methods for identifying high priority marine pollutants based in part on such data;

- GESAMP, in consultation with other expert groups, propose guidelines for test programmes to evaluate toxicity of potential marine pollutants;
- FAO, WHO, IOC and IAEA encourage studies of the effects of high priority marine pollutants on man and other organisms, with appropriate emphasis on chronic, low-level exposures;
- IOC, with FAO and WHO, explore the possibility of establishing an international institute for tropical marine studies, which would undertake training as well as research.

- MONITORING

237. It is recommended that IOC, in co-operation with other interested UN bodies, promote the monitoring of marine pollution, preferably within the framework of IGOSS and develop methods for monitoring high priority marine pollutants in water, sediments and organisms, with advice from GESAMP on intercomparability of methodologies.

- INFORMATION EXCHANGE

238. It is recommended that IOC ensure that provisions are made in international marine research and monitoring activities for dissemination of information in a form usable by Governments, with attention paid to the special needs of developing countries, and consider, with FAO, the need for expansion of existing data centres to fulfill anticipated needs, with emphasis on referral systems.

(iii) Control

239. It is recommended that:

- governments collectively endorse the principles set forth in paragraph 197 as guiding concepts representing a basis for general agreement, in particular at the 1973 IMCO Conference on Marine Pollution and at the Law of the Sea Conference scheduled to begin in 1973;
- the Secretary-General, with the support of FAO, IAEA and UNIDO, consider providing guidelines to Governments for the control of all significant sources of marine pollution, including especially land-based sources, including recommendations as to the best practicable means.

(iv) Support

240. It is recommended that:

- any intergovernmental mechanism which may be established within the United Nations in connexion with environmental problems should include among its functions overall responsibility for assuring that needed guidelines of this type are provided to Governments;
- the Secretary-General take steps to secure additional financial support to those training and other programmes of assistance that contribute to increasing the capacity of developing countries to participate in international research and monitoring programmes.

A/CONF.48/8/Add.1

# United Nations
# Conference on the human environment

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# Identification and control of pollutants of broad international significance

(subject area III)

## Addendum No. 1:
## Draft articles of a convention on ocean dumping

only one earth

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# IDENTIFICATION AND CONTROL OF POLLUTANTS OF BROAD INTERNATIONAL SIGNIFICANCE

(Subject Area III)

## Addendum No.1

## Draft articles of a Convention for the Prevention of Marine Pollution by Ocean Dumping

Work on the preparation of draft articles of a convention on ocean dumping was undertaken by the Interngovernmental Working Group on Marine Pollution established in accordance with a recommendation of the Preparatory Committee at its second session[1]. The Intergovernmental Working Group, at its second session (Ottawa, 8-12 November 1971), took note of the draft text of certain articles of an ocean dumping convention, without commitment on the part of the governments concerned, and agreed that governments should consult further on the subject of ocean dumping in the hope that agreement on concrete global action might be reached before the Conference[2].

Subsequently an Intergovernmental Meeting on Ocean Dumping was held at Reykjavik from 10-15 April 1972 at the invitation of the Government of Iceland. The meeting was attended by representatives of 29 States[3]. The resolution adopted by that Meeting, the draft articles of a Convention for the Prevention of

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[1] A/CONF.48/PC.9, para.42.

[2] A/CONF.48/IWGMP.II/5, para.19.

[3] The States represented at the Meeting were: Algeria, Argentina, Australia, Belgium, Canada, Denmark, Federal Republic of Germany, Finland, France, Ghana, Iceland, India, Iran, Ireland, Ivory Coast, Japan, Kenya, Malta, Mexico, Netherlands, Nigeria, Norway, Portugal, Singapore, Spain, Sweden, Tunisia, United Kingdom of Great Britain and Northern Ireland and United States of America.

Marine Pollution by Dumping appended thereto, and the report of the Intergovernmental Meeting are attached to the present document and submitted to the Conference at the request of the Government of Iceland.

The resolution adopted by the Intergovernmental Meeting invites the Conference to consider the draft articles and the report and take appropriate action thereon.

The subject of marine pollution, including pollution resulting from dumping, is treated in the Conference document entitled "Identification and control of pollutants of broad international significance" (A/CONF.48/8)4/, which includes recommendations concerning the control of ocean dumping.5/

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4/ See especially paras. 50-63, 192-217 and 233-240.

5/ Paras. 209-211 and 233.

## A. RESOLUTION

(adopted at Reykjavik, Iceland on 15 April 1972)

The Intergovernmental Meeting on Ocean Dumping

Resolves to forward to the United Nations Conference on the Human Environment for further consideration and appropriate action the draft articles of a Convention for the Prevention of Marine Pollution by Dumping and the report of the Meeting appended to this resolution.

## B. DRAFT ARTICLES OF A CONVENTION FOR THE PREVENTION OF MARINE POLLUTION BY DUMPING

The States Parties to this Convention

Recalling the general principles for assessment and control of marine pollution agreed upon by the United Nations Conference on the Human Environment,

Recognizing that the marine environment and all the living organisms which it supports are of vital importance to humanity, and all people have an interest in assuring that it is so managed that its quality and resources are not impaired,

Recognizing that the capacity of the sea to assimilate waste and render them harmless, and its ability to regenerate natural resources, is not unlimited,

Recognizing that States have the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limit of national jurisdiction,

Recalling that the General Assembly of the United Nations solemnly declared that the sea-bed and ocean floor beyond the limits of national jurisdiction and its resources are the common heritage of mankind,

Noting that marine pollution has many sources other than dumping at sea, including discharges through the atmosphere and rivers, estuaries, outfalls and pipelines within national jurisdiction, that it is important that States use the best practicable means to prevent such pollution and that products and processes which will minimize the amount of harmful waste requiring disposal should be developed,

Being convinced that international action to control the pollution of the sea by dumping can and should be taken without delay, but that this action should not preclude discussion of measures to control other sources of marine pollution as soon as possible,

Wishing to improve protection of the marine environment by encouraging States interested in common areas of sea to enter into appropriate agreements supplementary to this Convention:

Have agreed as follows:

### Article I

Each Party pledges itself to use its best endeavours to prevent the pollution of the sea by matter that is liable to cause harm to the marine environment and its living resources, hazards to human health, hindrance to marine activities including fishing, impairment of quality for use of sea water, or reduction of amenities.

## Article II

The Parties shall take effective measures individually, according to their capability, and collectively to prevent marine pollution caused by the dumping of harmful matter and shall harmonize their policies in this regard.

## Article III

For the purposes of this Convention,

1. "Dumping" means any deliberate disposal at sea of matter from vessels or aircraft, including matter transported to fixed or floating platforms at sea for deliberate disposal. The deliberate disposal of vessels, aircraft or platforms will also constitute dumping. The disposal of matter incident to or derived from the operations of vessels or aircraft and their equipment, other than the cargo of vessels or aircraft operating for the purpose of disposal of matter or the products derived from the treatment of such cargo on board, shall not constitute dumping.

2. "Vessels and aircraft" means waterborne and airborne craft of any type whatsoever. This expression includes air-cushioned craft and floating craft, whether self-propelled or not, but excludes fixed or floating platforms.

3. "Sea" means the high seas, territorial seas and bays.

4. "Matter" means material and substance of any kind, form or description.

5. "Special permit" means permission granted specifically on application for the dumping at sea of matter listed in Annex II.

## Article IV

Each Party shall prohibit the dumping of any matter in the sea except as this Convention may allow.

(a) The dumping of matter listed in Annex I is prohibited.

(b) If a Party shall determine that the dumping of matter other than that included in Annex I, has a deleterious effect on the marine environment equivalent to or greater than that of matter listed in Annex I, then that Party shall prohibit the dumping of that matter and notify the other Parties accordingly.

(c) The dumping of all other matter is prohibited except in accordance with Article VI.

## Article V

The provisions of Article IV shall not apply where the safety of human life is threatened.

## Article VI

(a) Each Party shall designate an appropriate national authority or authorities to:

- (i) issue special permits which shall be required for the dumping of the matter listed in Annex II;
- (ii) issue permits or approvals which shall be required for the dumping of all other matter;
- (iii) keep records of the nature and quantities of all matter permitted to be dumped and the location, time and method of dumping;
- (iv) monitor individually or in collaboration with other Parties and competent international organs the conditions of the seas within which they permit dumping.

(b) In issuing permits or approvals for such dumping, the national authority or authorities shall observe the provisions of Annex III together with such additional criteria, measures and requirements as they may consider relevant.

(c) Each Party shall report in an appropriate manner to other Parties the criteria, measures and requirements it adopts in order to fulfil its obligations under this Convention.

## Article VII

(a) In order to further the objectives of this Convention, the Parties with common interests to protect in the marine environment in a given geographical area should endeavour to enter into agreements on a regional level.

(b) More stringent criteria or prohibitions required under a regional agreement shall be respected by all Parties to the present Convention if dumping within that region.

(c) Parties to such regional agreements shall apply its provisions so as to prevent the diversion of dumping into seas outside the area to which it applies.

## Article VIII

Each Party directly or through a secretariat established under a regional agreement shall provide to the organization referred to in Article XII (b) and to the other Parties information specified in sub-paragraphs (iii) and (iv) of Article VI (a). The frequency and format of such reports shall be agreed by the Parties in consultation.

Article IX

(a) Each Party shall apply the measures required to implement the present Convention to all:

(i) vessels and aircraft registered in its territory;

(ii) vessels and aircraft loading in its territory matter which is to be dumped;

(iii) vessels and aircraft and fixed or floating platforms under its jurisdiction believed to be engaged in dumping.

(b) Each Party shall take in its territory appropriate measures to prevent and punish conduct in contravention of the provisions of this Convention.

(c) The Parties agree to co-operate in the development of procedures for the effective application of the Convention particularly on the high seas.

(d) Nothing in this Convention shall abridge the sovereign immunity to which certain vessels are entitled under international law.

or

[Each Party undertakes to adopt appropriate measures ensuring that requirements equivalent to those of this Convention are, so far as possible, applied to warships and military aircraft, and vessels and aircraft in government non-commercial service owned or operated by a Party and entitled to sovereign immunity under international law.]

(e) Nothing in this Convention shall effect the right of each Party to adopt other measures, in accordance with the principles of international law, to prevent dumping at sea.

Article X

The Parties recognize that in accordance with the principles of international law States bear responsibility for damage to the environment of other States or to areas beyond the limits of national jurisdiction caused by dumping and undertake to develop procedures for the assessment of liability and for the settlement of disputes.

Article XI

The Parties pledge themselves to promote, within the competent specialized agencies and other international bodies, measures concerning the protection of the marine environment against pollution caused by oil and oily wastes, other noxious or hazardous cargoes, radioactive materials and agents of biological and chemical warfare.

Article XII

(a) The Parties will meet on the call of the depositary not later than three months after the entry into force of this Convention to decide on organizational matters.

(b) The Parties shall designate an organization to be responsible for secretariat duties in relation to this Convention. The duties of the organization shall include the convening of consultative meetings of the Parties, not less frequently than once every two years. Such consultative meetings may, inter alia

- (i) review and amend the contents of the Annexes to this Convention;
- (ii) consider any additional action that may be required;
- (iii) receive and consider reports made pursuant to Article VIII.

(c) The Parties at their first consultative meeting shall agree on rules of procedure for such meetings.

Article XIII

Nothing in this Convention shall prejudice the codification and development of the law of the sea by the United Nations Conference on the Law of the Sea convened pursuant to resolution 2750 C (XXV) of the General Assembly of the United Nations.

Article XIV

(a) (i) A conference for the purpose of reviewing or amending this Convention may be convened by the depositary at the request of two-thirds of the Parties. Amendments approved at the Conference by a two-thirds majority shall enter into force on the sixtieth day after the approval of two-thirds of the Parties has been communicated to the depositary. An amendment shall come into force with respect to all Parties except those which, before it comes into force, make a declaration that they do not accept the amendment.

(ii) The depositary shall inform all Parties of any request made under this Article as well as of any amendments which may come into force under this Article, together with the date on which each such amendment comes into force.

(iii) Any acceptance or declaration of objection under this Article shall be made by the deposit of an instrument with the depositary.

(b) The provisions of paragraph (a) will also be applicable to the amendment of the Annexes to this Convention, except that the formulation of such amendments will be undertaken by a consultative meeting as called for in Article XII (b) and will not require a special conference.

Article XV

This Convention shall be open for signature by ... as follows: until ... at the Ministry of Foreign Affairs of Sweden, and subsequently, until ..., at United Nations Headquarters, New York.

Article XVI

This Convention is subject to ratification. The instruments of ratification shall be deposited with ...

Article XVII

This Convention shall be open for accession by any States referred to in Article XV. The instruments of accession shall be deposited with ...

Article XVIII

1. This Convention shall come into force on the thirtieth day following the date of deposit of the ... instrument of ratification or accession.

2. For each State ratifying or acceding to the Convention after the deposit of the ... instrument of ratification or accession, the Convention shall enter into force on the thirtieth day after deposit by such State of its instruments of ratification or accession.

Article XIX

Any Party may withdraw from this Convention by giving six months' notice in writing to the depositary, who shall promptly inform all Parties of such notice.

Article XX

The depositary shall inform Contracting States and Parties:

(a) of signatures to this Convention and of the deposit of instruments of ratification, accession or withdrawal, in accordance with Articles XV, XVI, XVII and XIX.

(b) of the date on which this Convention will come into force, in accordance with Article XVIII.

(c) of the receipt of notifications of approval or declarations of objection relating to amendments to this Convention and to its Annexes and of the entry into force of such amendments in accordance with Article XIV.

Article XXI

The original of this Convention of which the Chinese, English, French, Russian and Spanish texts are equally authentic, shall be deposited with ... who shall send certified copies thereof to all States referred to in Article XV.

IN WITNESS WHEREOF the undersigned Plenipotentiaries, being duly authorized thereto by their respective Governments have signed the present Convention

Done at ... this ... day of ... 1972.

## Annex I

1. Organohalogen compounds and compounds which may form such matters in the marine environment, including but not limited to Aldrin, Lindane, Chlordane, DDT, Dieldrin, Endrin, Heptachlor, Hexachlorobenzene, Polyhalogenated Biphenyls, and Toxaphene.

2. Mercury and mercury compounds.

3. Cadmium and cadmium compounds.

4. Persistent plastics and other persistent synthetic materials, which may float or may remain in suspension in the sea in such a manner as to interfere materially with fishing, navigation or other legitimate uses of the sea, for example netting and ropes.

5. Crude, fuel, heavy diesel, hydraulic fluids and lubricating oils, and mixtures containing these oils, taken on board for the purpose of dumping.

[6. High-level radioactive wastes.]

[7. Agents of biological and chemical warfare.]

8. This Annex does not apply to wastes or other material, such as sewage sludge and dredge spoil, containing small or trace quantities of the matters referred to in paragraphs 1-5 above. Such wastes shall be subject to the provisions of Annexes II or III as appropriate.

9. Paragraph 1 of this Annex does not apply to substances which are rapidly metabolized into a harmless substance or eliminated and which do not render the flesh of edible marine organisms unpalatable or lead to a danger to human health or that of domestic animals.

Footnotes

(a) For a period of five years from the date when the present Convention comes into effect, wastes containing small quantities of matters named in paragraphs 2 and 3, if containerized or encased in concrete according to procedures agreed upon by the Organization, may be dumped in depths of not less than 4,000 metres in conditions which would cause no harm to the marine environment and its living resources. These acts should be subject to the provisions of Articles VI (a) (i) and (iii).

## Annex II

The following substances and materials requiring special care are listed for the purposes of Article VI(a)(i):

A. - Wastes containing significant amounts of the matters listed below,

- arsenic)
- lead )
- copper ) and their compounds
- zinc )
- organosilicon compounds
- cyanides
- fluorides
- pesticides and their by-products not covered in Annex I.

B. In the issuance of approvals or permits for the dumping of large quantities of acids and alkalies, consideration shall be given to the possible presence in such wastes of the substances listed in paragraph A and to the following additional substances:

beryllium )
chromium )
nickel ) and their compounds
vanadium )

C. Containers, scrap metal and other bulky wastes liable to sink to the sea bottom which may present a serious obstacle to fishing or navigation.

## Annex III

Provisions to be considered in establishing criteria governing the issue of permits for the dumping of matter at sea shall include:

A. Characteristics of the matter

(1) Amount and composition;

(2) Amount of substances and materials to be deposited per day (per week, per month);

(3) Form in which it is presented for dumping, i.e. whether as a solid, sludge or liquid;

(4) Physical (especially solubility and density), chemical and biochemical (oxygen demand, nutrients) and biological (presence of viruses, bacteria, yeasts, parasites, etc.) properties;

(5) Toxicity;

(6) Persistence;

(7) Accumulation in biological materials or sediments;

(8) Susceptibility to physical changes, chemical changes and interaction in the aquatic environment with other dissolved organic and inorganic materials;

(9) Probability of production of taints or other changes reducing marketability of resources (fish, shellfish, etc.).

B. Characteristics of dumping site and method of deposit

(1) Location, including geographical position, depth and proximity to coast lines, amenity areas, spawning, nursery and fishing areas and exploitable resources;

(2) Methods of packing and containment, if any;

(3) Initial dilution achieved by proposed method of release;

(4) Dispersal, horizontal transport, vertical mixing characteristics and effects of tides and wind;

(5) Water characteristics (e.g. temperature, salinity, stratification, dissolved oxygen content, suspended matter, nutrients, productivity, etc.);

(6) Type, topography, geological character and biological productivity of bottom;

(7) Existence and effects of current and previous discharges and dumping in the area (e.g. heavy metal background reading, organic carbon content, etc.).

C. General considerations and conditions

(1) Effects on amenities (e.g. presence of floating or stranded material, turbidity, objectionable odour, discolouration, foaming);

(2) Effects on other uses of the sea (e.g. impairment of water quality for industrial use, underwater corrosion of structures, interference with ship operations from floating materials, interference with fishing or navigation through deposit of waste or solid objects on the sea floor, fish and shellfish culture, seaweed harvesting and culture, protection of areas of special importance for scientific or conservation purposes);

(3) The practical availability of alternative means of disposal or elimination.

## C. REPORT OF THE INTERGOVERNMENTAL MEETING ON OCEAN DUMPING

(Reykjavik, 10-15 April 1972)

1. The Intergovernmental Working Group on Marine Pollution considered the subject of ocean dumping at each of its two sessions held during 1971. At its second session (Ottawa, 8-12 November 1971), the Intergovernmental Working Group, having noted without commitment the draft text of certain articles of an ocean dumping convention, agreed that Governments should consult further on this subject in the hope that agreement on concrete global action might be reached before the United Nations Conference on the Human Environment.[1]

2. After a subsequent exchange of views among interested Governments, it was concluded that such consultation could best be achieved by convening an intergovernmental meeting at the earliest possible opportunity. At the invitation of the Government of Iceland, the Intergovernmental Meeting on Ocean Dumping was held at Reykjavik from 10 to 15 April 1972.

3. The Meeting was attended by representatives from 29 States, and by observers from the United Nations, the Food and Agriculture Organization, the Intergovernmental Maritime Consultative Organization and the International Atomic Energy Agency. [A list of participants is contained in annex A to this report.][2]

4. Mr. Hjálmar R. Bárdarson, State Director of Shipping of the Government of Iceland, was elected Chairman. Mr. Donald W. Kaniaru (Kenya), Mr. Abolfazl Farid (Iran) and Dr. Julian Güitrón Fuentevilla (Mexico) were elected Vice-Chairmen.

5. Mr. Einar Ágústsson, the Minister for Foreign Affairs of Iceland, welcomed the delegations on behalf of his Government. He stressed the great interest of his country in preserving the marine environment, and hoped that significant progress in this respect would be achieved at the Stockholm Conference.

[6. The agenda as adopted is in annex B and a list of documents submitted to the Meeting in annex C to this report.][3]

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[1] Report of the Intergovernmental Working Group on Marine Pollution on its second session, document A/CONF.48/IWGMP.II/5, para. 19. For the report on the first session, see document A/CONF.48/IWGMP.I/5.

[2] The 29 participating States are listed in footnote 3 in the cover note to the present document; the full list of participants is not reproduced.

[3] Not reproduced in the present document.

7. The Meeting was convened with a view to the preparation of the draft text of a convention to prevent pollution of the sea by dumping for submission to the Stockholm Conference. As working documents, the Meeting had before it the draft of a convention submitted by the United States, together with the draft articles produced by the Intergovernmental Working Group on Marine Pollution at its Ottawa meeting, the text of the Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft (Oslo Convention 1972) and draft articles submitted by Canada. The Meeting established a working group on the annexes to the proposed convention, which met under the chairmanship of Dr. H. A. Cole (United Kingdom), and a drafting group, of which the chairman was Mr. T. C. Bacon (Canada).

8. After considering the various texts before it and the papers prepared by the working group and the drafting group, the Meeting produced the text of draft articles of a Convention for the Prevention of Marine Pollution by Dumping [attached to this report as annex D.][4] A number of delegations expressed reservations and a wish to make reference to their Governments with respect either to the draft articles as a whole or as regards particular articles.

9. In a resolution [contained in annex E][5] adopted by the Meeting, it was resolved to forward the draft articles and this report to the United Nations Conference on the Human Environment for further consideration and appropriate action. The Government of Iceland was requested to transmit the resolution, the draft articles and the report, on behalf of the Meeting, to the Secretary-General of the Conference. The Secretary-General was asked to submit the resolution, including the draft articles, and the report, to the Conference and to circulate them to Governments without delay.

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[4] See Section B of the present document.

[5] See Section A of the present document.

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United Nations
Conference on the human environment

# Educational, informational, social and cultural aspects of environmental issues

(subject area IV)

only one earth

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Stockholm, 5-16 June 1972

Provisional agenda item 13

## EDUCATIONAL, INFORMATIONAL, SOCIAL AND CULTURAL ASPECTS OF ENVIRONMENTAL PROBLEMS

(Subject area IV)

Report by the Secretary-General

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## INTRODUCTION

1. The Conference on the Human Environment draws its inspiration from the philosophy of action of the United Nations as formulated in the Preamble to the Charter and in the Universal Declaration of Human Rights.

2. The struggle for a decent environment is really no more than a demand that man should be able to develop more fully. The decision to take into account the social and cultural aspects of the environment reflects the need for a very broad approach to development, involving cultural and ethical choices.

3. The addition of this new dimension to development prompts the following questions:

(a) What efforts will men and the States that govern them be willing to make in order that development may come nearer to satisfying human aspirations to freedom, justice, social well-being and beauty?

(b) To what discipline will they submit in relation to the natural environment in order to safeguard future generations through equitable management, at the world level, of the resources of the biosphere?

4. This study will deal in turn with the following:

(a) In chapter I, with the need for action;

(b) In chapter II, with the objectives of action to safeguard and improve the environment;

(c) In chapter III, with the means of taking action;

(d) In chapter IV, with recommendations for action.

## Chapter I

## THE NEED FOR ACTION

### A. The social and cultural dimensions of environmental problems

#### (i) Historical aspects and change in space and time

5. The history of man, perpetually struggling to master for his own advantage a growing proportion of the flows of energy in the biosphere, shows that he has always been aware of the complex interactions between himself and his environment. Ecology teaches us how much every species depends on its biotic environment - i.e., on other living creatures - and on its abiotic environment - i.e., on the natural elements: water, air and so on.

6. The decline of certain past civilizations, which had flourished in spite of precarious ecological conditions, was closely associated with ill-judged exploitation of natural resources. The action of man is so closely interwoven with that of other environmental factors that, between the wrecking of the physical environment and the deterioration of the social and cultural setting, it is impossible to tell which is the cause and which the effect.

7. Today what has really changed between man and his environment - and this explains much of the present alarm - is primarily the scale of the physical phenomena caused by human activity. The activity of our species now extends over almost the whole of the continents. Prospecting for minerals and petroleum, forestry and various other activities in quest of natural resources no longer spare the deserts or the polar ice-fields. The sea-bed, and space itself, have become objectives in the conquest of the universe.

8. Earlier generations, it is true, bequeathed to us intensively developed geographical settings Mankind's wealth of monuments bears witness that, many centuries before the industrial revolution, builders were carrying out engineering works which are in no way inferior to the structures of today. However, the tremendous increase in man's power to affect the physical setting of his life is no longer reflected solely in the size of the things he creates. It is expressed, above all, in an unprecedented acceleration of the processes whereby the setting is changed. Thus an engineering project which formerly would have taken centuries of toil can now be completed in a few years.

(ii) New problems

9. Another factor for radical change in the relationship between man and his environment is the fact that the very nature of the problem is changing. Chemical pollution for example, which in the past was virtually non-existent or affected only very small sectors, is now notorious for its magnitude. Such pollution is no longer a matter solely for the countries where it originates; it affects an ever-increasing number of other countries besides.

10. Again, the increasing headway made by man in understanding fundamental biological mechanisms has led to remarkable advances, particularly in the selective breeding of plant varieties which offer a high yield or enhanced resistance to environmental attack. This raises a host of new problems.

11. Lastly the widespread process of urbanization, as well as embracing a great variety of situations, is now giving rise to a number of phenomena that affect the living conditions of most of the population in the social, economic and political setting in which those phenomena occur.

(iii) The growing awareness of the problems

12. The magnitude of the problems encountered, and the conflicting terms in which they arise, create what has come to be known as the environmental crisis. One obvious consequence of this crisis is that people fairly rapidly become aware of it. This awareness varies in form according to the social and economic situation in which it is acquired, but it has some constant features wherever it occurs. First, it is concerned almost exclusively with malfunctions of the environment, i.e. with adverse aspects which cause inconvenience.

13. Second, although at present the only people directly affected are those already exposed to radical changes, it is clearly realized that within one generation the effect of these changes may extend to the entire population. At the present rate of economic growth, how many human beings can remain untouched by profound changes in the environment? Again, even assuming that these changes are due to desired and desirable development, is it conceivable that the beneficiaries of economic progress or, *a fortiori*, those whom it leaves behind will remain insensible to the tensions set up by the disturbances in living conditions?

### (iv) General manifestations of the problems

### The ecological crisis

14. The environmental crisis has been described so often from the strictly ecological standpoint that there seems no need to dwell on it here.

The *population explosion* set off by advances in hygiene and medicine will, barring some major event, increase the world population from 3,500 million to some 7,000 million within thirty years, whereas the figure has taken three centuries to increase from 500 million to 3,500 million.

15. Whereas for a great part of the world population the *material level of living* changes very slowly, it is rising fast, by a cumulative process, for another part of mankind. What is more, production and consumption generally involve *wastage of material resources*, either through dumping of a growing volume of *non-recycled waste products* or, for example, through *mismanagement* of soil, forests or fauna.

16. The population explosion, the rise in the level of living, and wastage are still very unevenly distributed among geographical areas. Nevertheless, the combination of these three factors makes for a general increase in the *pressure exerted on natural resources* - the *quantitative* pressure exerted by consumption and the *qualitative* pressure exerted by damage or destruction.

### The deterioration of human settlements

17. In the social and cultural sphere, too, the environmental crisis exhibits *a few main constant features* which, here again, are in evidence under a wide variety of conditions. The great migrations to the cities, which have two essential causes - the concentration of activities round a few poles of attraction, especially in the rich countries, and the flight from the poverty of areas bypassed by development - have brought on a *growth crisis* in the major urban areas. Thus the population of the main cities in the developing countries quadrupled between 1920 and 1960.

18. Vast sections of these large cities - in some cases almost their whole area - are becoming the scene of a *grave deterioration in the environment*, ranging from appalling *health* conditions to a shortage of public facilities and services of all kinds as well as disfigurement of the urban landscape.

19. The most striking upheaval in social relations is the change from a traditional society organized in families or clans to a more individualized society in which each individual gains in independence and loses in solidarity with his fellows. The

change is a source of satisfaction, of liberation of the individual in his relationship to the environment; and at the same time it is a cause of behaviour reflecting anomie, new forms of alienation or distress at loneliness.

20. Accession to the benefits of scientific, technological and economic progress is accompanied in some countries by imperialism on the part of the culture of the societies in which this progress was first achieved. Transfers of technology and models of development subject the environment to "cultural aggression". This is reflected in standardization and uniformity in the setting of life and living conditions of the populations affected by economic development, both as between countries and as between regions of the same country.

21. This process of change, which is clearly visible in rural development, town planning, architecture and artefacts, and also in the organization of work, the use made of their time by the urban social groups affected by industrialization, and so on, sometimes leads to the surrender - not always justified - of autonomous cultural values and often to ecological absurdities, such as the adoption of a type of architecture unsuited to the local climate or the introduction of farming methods ultimately incompatible with natural factors.

22. The diminishing share of local cultures in the creation of the environment - the growing uniformity of architecture is one example - sets up additional social tensions, for it reflects failure to take into consideration the ways of life of the populations concerned, failure to adapt, and impoverishment of the local environment. Physically it reveals itself in an increasing monotony and disfigurement of the setting of life.

### (v) Environment and cultures

23. The environment is not, of course, a mere aggregate of natural conditions. It is both the imprint of the society which has created it, with its beliefs, myths and dreams; and it is the matrix of that society.

#### The environment as the imprint of society

24. The environment speaks a language of its own through such media as social organization, the geographical structure of a landscape and the use made of time. In this sense, then, the environment is reflected in a material culture. Thus the appearance, at a given moment, of deterioration in the quality of certain components of that environment points to correlative social and cultural changes; and when the deterioration is sufficiently serious it reveals acute social and political tensions.

Conversely an improvement in the quality of the environment indicates progress at the level of the individual or of the groups who have brought about that progress and who benefit by it.

### The environment as the matrix of society

25. The environment is fashioned by the culture, which in its turn is moulded by the environment. It is a well-known fact that the natural conditions with which peoples live in contact have a profound effect on their culture. This effect doubtless tends to diminish as the environment becomes increasingly man-made, in particular through urbanization. Nevertheless, the components of a developed life-setting are still able to put their stamp on some individuals and societies.

26. The environment, as a material culture, is the vehicle for systems of values. Daily frequentation of that environment by individuals and social groups imbues them with certain values and influences their social and cultural development. Hence changes in the environment have a considerable effect on individual and collective attitudes, although that effect is often blunted by the rigidity of social relationships.

27. Of course, in the quest for better living conditions, there is no denying the need for cultural changes, beginning with the acquisition of literacy; cultural development itself is inconceivable without calling age-old values into question. In extreme cases it takes a veritable cultural revolution to enable poverty-stricken populations to begin making progress. But it is precisely in those situations where the need for change is most imperative and most urgent that care must be taken to avoid unnecessary cultural losses and to preserve the most valuable features of the heritage. Avoidance of needless losses means that the people whose well-being it is desired to enhance will not be completely disoriented, but will be able to retain certain landmarks in their way of life while other landmarks are being created.

28. It is thus clear that any policy for improving the environment which neglects the social and cultural dimensions of the problems faced is bound in the long run to lead to social miscalculations which will set up acute tensions.

### (vi) Distinctive national features

29. Apart from these very general features, the environmental crisis obviously takes widely varied forms and differs completely in its impact according to the level of economic development and the social and cultural context in which it occurs.

30. The first difference observable between affluent societies and indigent societies lies in the priorities accorded to the various problems which arise. However, it should be borne in mind that there are intermediate situations and, still more, that in most countries these two types of societies exist side by side in varying degrees.

31. In addition to the pressure brought to bear on resources, the relatively affluent economies - at present characterized by some wastage at the consumption stage - are beset by environmental problems relating to comfort, mental health, the physico-chemical hygiene of the environment (pollution) and the use of time and space. These problems are constantly cropping up, whether in relation to housing, to work or to leisure.

32. In a scarcity economy, the aspirations in evidence in the quest for well-being are more elementary. Improving the environment is mainly a matter of better management of the biological resources used in meeting food requirements: the soil, edible species of plants, terrestrial and aquatic fauna. Problems also arise in connexion with hygiene and sanitary conditions; with the creation of stable jobs, particularly in the countryside as a means of reducing congestion in the cities; and, in many regions, with population pressure.

33. In the cultural sphere it is difficult, in view of the prevailing differences, to establish a simple classification of attitudes to the environment. However, it will be of some help to distinguish between technological societies, whose main characteristics know no frontiers, and what may be termed traditional societies:

(a) In technological societies, the foundations of industrial and urban civilization are involved;

(b) In traditional societies, certain traditions and beliefs obstruct any improvement of the environment; in this connexion, the very nature of the problems which arise in the developing countries emphasizes the fact that psycho-sociological patterns are by no means the smallest obstacles to economic growth.

## B. The social and cultural roots of the crisis

### (i) Some general aspects

34. In the context of economic growth and of the industrialization which, in most countries, is the preferred motive force for such growth, scientific and technological progress has provided man with a wide range of means of taking action. However, as a

result of behaviour dictated largely by an almost blind worship of technology, some environmental changes have had immediate or delayed side-effects which have sometimes ended in disaster: floods, pollution or the making of deserts.

35. Science and its technical applications, which would make man the master of the universe, free to use and misuse natural resources at will, often become an end in themselves. Man has often mismanaged his inheritance because he did not know how to reconcile technological development with the development - or conservation for the future - of the best part of the natural heritage.

36. Quite clearly, this attitude is due not only to ignorance of the fact that the resources of the biosphere are limited but also, and above all, to a certain philosophical conception of the world.

37. Whereas the pantheistic theories which preceded and accompanied the industrial revolution in nineteenth-century Europe invested living things with an element of divinity, with the result that they were held in respect, the new conquests of the mind and the discoveries of science have led not only to advantages which no-one would wish to discount but also to a kind of deconsecration of natural beings, which have been reduced more and more to the status of means.

38. These new conceptions find their highest justification in Judaeo-Christian religious beliefs, according to which God created man in His own image and gave him the Earth to bring under His law.

39. Other great civilizations, on the other hand, developed a different vision of the world, in which the human race inhabited the earth together with other living creatures in a spirit of balance. For example, in certain parts of Black Africa, the practices of ancestor-worship formed a bulwark for the environment inasmuch as animals, trees and even watercourses were protected and venerated as the reincarnation of men's ancestors. Today, through the intrusion of modern technology, which has been thrust on these societies indiscriminately and without prior adaptation, some people tend to regard these religious practices as representing obscurantist beliefs.

40. Henceforth, here and there, "culture" is arbitrarily contrasted with "nature" and "civilization" with "savagery". Man is placed outside, and even above nature. It is as if modern man, regardless of his political idealogy, had replaced the metaphysical gods - which were often objects of fear - and the humility which they inspired, by a new, more familiar and more reassuring god: Science, which makes all things possible and places its possessor on a kind of pedestal.

41. Although, in his daily behaviour, man may still turn to his ancient gods in times of doubt, he now questions himself only rarely about his own role in the universe. He seems to rely on science and technology, which are turning him into a passive consumer of goods that may, or may not be useful.

42. As to the scientists, the researchworkers whose discoveries shape the life of today as much as that of tomorrow, it is not certain that the final goal of their research is their main preoccupation.

43. In short, faced with the instrument of liberation that is science, with its technological applications, man finds himself in the situation of the sorcerer's apprentice. In this crisis, the responsibility lies at several levels:

(a) Firstly at the political level, where the decision-makers should give scientific research new priorities in keeping with man's real needs;

(b) Secondly at the level of the scientists, who should not take the place of the decision-makers but who nevertheless have a moral duty to reflect on the goal of their endeavours; and

(c) Lastly at the level of every individual who, by his behaviour and his attitude to the achievements of technology, should affirm his options - in other words, his freedom.

(ii) Economic aspects

44. These problems, with special reference to the developing countries, will be studied in subject area V of the Conference; here we shall merely mention a few aspects of these problems.

45. The organization of production and the rationalization of work with a view to increasing output have too often been regarded as ends in themselves. Whatever social and economic system is chosen, this preoccupation with production, whose benefits have enhanced well-being on an increasingly wide scale, inevitably has adverse effects on the environment and, in the last analysis on the development of the "whole man":

(a) First, the priority accorded to the short term sometimes causes other aspects of development to be neglected. Thus, paradoxically, the priority given to productivity leads to the depreciation and even the disappearance of the productive capital itself, which in many cases - and this tends to be forgotten - is neither renewable nor replaceable.

(b) Furthermore the external or secondary effects of economic projects, which levy social costs, are not always taken into account.

(c) The result - which is apparent in all parts of the world where economic growth is based on criteria of immediate profit and efficiency at all costs - is the concentration of human activities around certain poles of attraction - a concentration which quickly reaches an intolerable level - and deterioration of the environment in human settlements. The inordinate size of urban built-up areas and industrial complexes, the crowding together of dwellings, the lack of open spaces, ugliness and lack of social contact are ills which are met with in many large centres of population throughout the world which, at least from this point of view, all grow to look alike in the end. Thus economic progress, which in days past may have justified those concentrations around sources of raw materials or reserves of manpower, is largely diverted from its purpose, which is to enhance human well-being.

46. This faces the developing countries with the problem of deciding whether the growth model whose adverse implications have just been briefly described can and should still be imitated as it stands. There can be no question of limiting economic growth, which remains essential in order to secure for the population of those countries the minimum of material well-being that is the first prerequisite of any good environment. It would be unjustified and unjustifiable to urge the imposition of any limitation whatsoever on the quest for this well-being on the grounds of danger to the global environment. Nevertheless - quite apart from the ills already mentioned - if the developing countries adopt without reservation, and without prior adaptation, growth models which have proved their worth in familiar social and historical conditions, will they not run the risk of seriously upsetting social and cultural balances - a risk which they could well do without? The evolution of societies shows that the developing countries should seek different solutions designed to reconcile swift economic growth with the requirements of a good environment.

(iii) Political aspects

47. Consideration of the environment as a new dimension of human development is essentially a political question. It is for the decision-makers, under pressure from those whom their decisions affect, to answer the questions: "What kind of cities will people be living in tomorrow? In what kind of countries? In what kind of world?"

48. Of course, the practical solutions to these problems will be chosen, applied and received differently according to the political ideology which prevails. Several kinds of solutions are conceivable. The fact remains that, in the last analysis, all solutions must aim to satisfy the fundamental needs of man who, while demanding to have more, at the same time aspires to be more.

49. The very nature of environmental problems - that is to say, their intricate interdependence - is such as to require political choices. No clear choice can be made and no effective action can be taken without re-examining the decision-making structures at all levels - local, national and international - in order to ensure that the policies to be applied reflect in all cases, not the will of a group however powerful, but the general interest.

### (iv) Remaking plans for civilization

50. The formulation and application of comprehensive, long-term environmental policies place the entire problem of cultures and the problem of development in a new light. As regards the environment in which we wish to live, defining the available options and making a selection from among them entail making a set of fundamental social and cultural choices and remaking each country's plans for civilization.

51. The first stage in the profound cultural change taking place under the pressure of environmental problems is that of becoming aware of those problems; this raises the question of attitudes to the environment. In the context of development, a favourable attitude to the environment means that systems of values undergo change and adaptation in the direction of questioning certain behaviour patterns associated with haphazard economic growth, or characteristic of under-development, and in the direction of cultural innovation through a search for new values which will both enrich cultures based on an age-long heritage and help nascent cultures to mature.

## C. The basis for action

52. The growing awareness just described and the realization that the notion of environment hinges on man himself and that development must be brought back to its original purpose, which is to enhance human well-being, are reflected in aspirations and demands which determine the goals of the measures to be undertaken.

53. One of the first of these aspirations is to safety and security, physical and mental: the safety of shelter from the rigours of climate and bad weather, and of walls to keep out the intruder; the security of steady employment, here in a society which is too complex and too agitated, and there in a rapidly developing society; security

when faced with a technology which sets a pace of living that is difficult to maintain indefinitely. Any ordering of the human environment which does not satisfy this aspiration to a sheltering environment leads to unstable behaviour, a mixture of defensive withdrawal and aggressiveness.

54. Very closely related to the aspiration to security is the equally compelling desire for a meaningful environment. This concept overlaps and elucidates the notion of security in that a sheltering environment is necessarily made up of familiar and reassuring components. But its connotations go much further. Man, like any other living being, needs to be able to survive and not to be in continuous conflict with the world around him; he needs to be able to understand it and find his bearings in it. If he is to develop, he needs to recognize himself by finding symbols which link up with his culture and with his system of values. Otherwise he is lost, and ultimately crushed by an organization of space, architecture and landscape which remain alien to him.

55. The individual is also moved by other aspirations. He wishes, in varying degrees, to approach other people. Although at times he is apt to seek privacy and relative solitude, at other times he wishes to have contact and direct communication with others, to experience novel and unknown sensations and events. He will seek recreation and enjoyment.

56. Lastly, the individual's attitude is affected by phenomena which he feels to be nuisances, attacks upon his well-being. A consciously perceived nuisance exposes the psyche to stimuli similar to a sense of insecurity, and the more violent the attack seems to be, the more the effects on behaviour will resemble those of anxiety. Noise - which is pollution by sound - and the feeling of being hemmed in which goes with a lack of open spaces or a high density of population have a profound effect on the individual. The ruin of an urban or rural landscape and the aesthetic debasement of the shapes of familiar objects may give an impression of ugliness, disharmony and aesthetic pollution to the point of imposing stress on some people.

57. The demands described above are not confined to countries where people have realized the existence of environmental problems and are growing ever more aware of them. They are equally and perhaps even more prevalent in peoples whose necessary march towards material progress entails a continuous effort of adaptation. Reference has often been made to the ills of civilization, but perhaps not enough attention has hitherto been paid to their most alarming aspect: namely, acculturation. True, one of man's most remarkable characteristics is his capacity to adapt himself to new situations. But are not some adaptations also deformations?

## Chapter II

## THE OBJECTIVES OF ACTION

58. From a study of the social and cultural components of the environment and of the effects produced on the conditions and quality of life by the changes through which we are living, and from the social values expressed in contemporary aspirations, it is possible to define the objectives of action to improve the human environment:

### A. To maintain and restore the biosphere

59. For the world as a whole, the protection of the biosphere from disastrous changes is of necessity the primary aim. Every continent is deeply scarred by human appropriation and by mismanagement of the biosphere's resources. Pollution is altering the physiognomy of developed areas and the main biogeochemical cycles of nature, even in the oceans which are the source of life and the biosphere's last reserve of balance. Doubtless, contrary to some predictions, the ecological day of doomsday is not an immediate prospect, but the continuance of past trends would assuredly present unacceptable risks. It is time to take action in this matter with all the resources that technical progress places at our disposal; for it must be accepted that, whatever evils science and technology may have wrought, they are our only hope of building a better world if mankind is willing to put them to new uses.

### B. To improve the quality of life

60. To maintain biological conditions which are satisfactory from the standpoint of human needs it is not enough merely to forestall an ecological disaster which would ruin some of the food supply, make water and perhaps oxygen a rare commodity, and alter climates. There is a second imperative: preventive action against disease and death. Biological environmental sanitation is needed to suppress the propagation of pathogenic agents without destroying natural settings. In spite of great progress in sanitation, the great masses of population in the Third World are still a prey to endemic microbial and virus diseases and epidemics. In the economically advanced countries, biological agents which had become rare - the hepatitis virus for instance - are recrudescent, and the "diseases of civilization" - diabetes, obesity, psychosomatic and mental disturbances - are on the increase.

61. In varying degrees, but throughout the world, physico-chemical pollution is on the increase in the air, water and food: general micropollution with very long-lasting effects about which little is known, and a more concentrated pollution, whose

effects are scarcely better understood, in human settlements. On these two fronts, where the requirements sometimes seem contradictory, the struggle for health calls for immediate large-scale effort supported by systematic research according to well-defined priorities.

C. To promote the development of the "whole man"

62. Human advancement, the fundamental purpose of United Nations activity, appears in a new light when considered in terms of the problems of the environment, which all point to the need for a new definition of human progress.

Integrity and well-being

63. At the level of the individual, concern for man's physical, biological and mental integrity dictates, so far as the environment is concerned, elimination of the nuisances peculiar to human settlements, which mean little on the World scale: excessive noise or vibration, overcrowding, congestion and discomfort, which are sources of tension, fatigue and illness.

64. Beyond this, the quest for individual well-being, especially mental well-being, though this is inseparable from integrity, requires different qualities in the environment. The environment should equip the individual, according to the cultural context in which he lives, to withstand other forms of aggression - the constant violation of normal human scales, the lack of sufficient open spaces, the incoherence of architectural shapes and the incomprehensibility of the urban landscape. It predisposes him to favor the establishment of systems of social relations which are felt to be freely desired and not excessively restrictive.

Greater freedom

65. The basis of freedom is the existence of a choice. The environment can and should help to increase individual freedom in spite of the increasing number and weight of collective constraints, some of which, incidentally, arise from the desire to safeguard or improve the quality of the environment itself. The planning of the environment, as the setting of life and the prime factor in living conditions, is calculated to give everyone a wider range of choices and to encourage people to question conditioned patterns of behaviour and ways of life which impose mental stress.

### Cultural development

66. The environment is an invaluable instrument of cultural development. Making the best of the heritage and creating new environments as vehicles of beauty and cultural values can arouse responsiveness to those values and imbue the mind with them. To take the idea a step further, a dynamic environment policy is a form of access to culture for all. Developed to the full, it permits and invites individual or collective activities which offer the opportunity for participation in acts of cultural creation and for the revival of popular culture as a reaction against the imperialism of "transnational" culture's stereotypes.

### D. The sense of responsibility and solidarity

67. Man - psychologically more and more cut off from nature; conscious of becoming ever more impotent and at the mercy of external forces beyond his control as the environment changes under the pressure of technology; feeling, as soon as he enters industrial and urban civilization, that he has been left alone to solve his problems - is gradually losing his sense of responsibility and solidarity. Any policy for the environment must resist this trend. Every individual is personally involved in the responsibility which mankind must henceforth bear for the conservation and rational management of natural resources as well as the setting of life in human settlements and the man-made countryside. The individual should be persuaded to take the opportunities for action which are open to him, and encouraged to use the freedoms afforded him by society.

68. Furthermore various forms of selfishness must be counterbalanced by solidarity in many matters:

(a) Solidarity with future generations, to whom we are accountable for the natural assets and cultural heritage passed on to us by earlier generations, and who must not be left with too heavy a burden in restoring the environment as a result of our negligence;

(b) Solidarity among the citizens of a given country;

(c) Solidarity between countries to prevent transfers of pollution across frontiers, harmful distortions in the pattern of trade, and further economic, social or cultural imbalances.

(d) Solidarity in protecting, maintaining and cultivating the common natural and historical heritage of mankind.

## E. Emergence of environmental ethics

69. At the conclusion of this review of the objectives of action, the improvement of the human environment emerges as the requirement of a new set of ethics. The fight for the environment is the point of convergence of most of contemporary mankind's major social problems with the great clash between development and underdevelopment; it provides an unusual opportunity to promote the universally recognized, fundamental moral and cultural values which we call diversity, freedom and solidarity.

### From awareness to responsibility

70. Awareness of ecological and cultural "aggression" leads directly to a sense of responsibility, provided that the individual can be convinced of the scope for action and creation in this matter.

### From responsibility to solidarity

71. Furthermore, in view of the collective nature of the environment as evidenced by the common "appropriation" of the space necessary for social equilibrium, the sense of responsibility towards the environment as a heritage and as a dimension of development leads in turn to a solidarity which extends far beyond the family circle, the neighbourhood, the region or even the country.

### A social and cultural response to a social and cultural crisis

72. The environment is the image of the society imbued with its values; it reflects the state of that society and its aptitude for development. The ills of the environment are more than the price paid for progress; they are probably symptoms of a deep-seated crisis in the evolution of modern societies. Hence long-term solutions cannot be found outside this context.

73. Thus the conservation, improvement and re-creation of the environment, approached in this spirit, can provide a desirable basis for social development. The achievement of a good environment is bound up with the achievement of greater social justice, of less inequality between men and between nations, and of a guarantee that the dignity of every man will be respected, through the enjoyment of increased freedom, cultural autonomy and participation in an environment designed for him and commensurate with his aspirations. It presupposes new rights, with the corresponding duties, in relation to others and in relation to a community widened to span the whole world: rights and duties of which the Declaration on the Human Environment could be the international charter.

## Chapter III

## THE MEANS OF TAKING ACTION

74. The actions which can be taken are multiple and complex, like the environment itself. In the social and cultural area there are special difficulties, but advances in the social and behavioural sciences hold out hope that certain forms of action will be effective provided that they are not undertaken in isolation, without regard for the reactions to them, or without making sure that they are mutually compatible. Since the environment is a system of relationships, all forms of action should be planned on the basis of systems analysis, by inter-disciplinary methods - the only means of grasping reality as a whole. This means that a continuous social diagnosis must be instituted in order to support essential action, some of the main forms of which will be examined in turn.

### A. Knowledge

75. A combination of clinical observation and environmental analysis should provide an exact picture of man's impact on the environment and of the consequences for man. This is a matter for team work, entailing co-operation in all the social and behavioural sciences; for it is impossible to study the environment without applying several disciplines at once. Similarly the magnitude of the differences between cultures and the necessity for comparative analysis require that research on the environment should be broadly intercultural.

76. A large volume of data has already been collected by the United Nations and by many scientific centres whose locations include most of the world's countries. The assembly and systematic comparison of these data would permit a preliminary assessment of situations, which could be filled out by research in the field. Furthermore detailed processing, with the collaboration of specialists in all the social sciences, would make possible the precise definition of fundamental concepts, of which an instinctive sense is no longer enough. The idea is to progress towards the establishment of economic, social and cultural indicators as an aid to the planners and developers in their efforts to take into account the necessities of the environment. Let it be said that this is no easy task and still gives rise to argument as to whether certain indicators can be quantified or not. This is a further reason for intensifying research in this field.

77. In the developing countries, where economic growth is often accompanied by cultural upheavals, a special effort should be made to promote the study of traditions and popular arts, which remain, beyond any doubt, the only firm foundation for harmonious development.

## B. Teaching and education

78. The wave of unrest affecting all universities, in the most varied cultural contexts, reflects fundamental problems of political protest side by side with questioning of all systems of education. In this matter as in others - urbanization for instance - the situation conveys a sense of the universality of the contemporary world's problems, and blurs political and cultural differences.

79. The latest attitude to the problems of teaching and education can be summed up in the axiom that strictly compartmentalized disciplines have had their day. Men are increasingly conscious of the need for a training which, through pluridisciplinary studies, will give them a comprehensive grasp of a world that is ceaselessly changing and that they hope to improve.

80. Furthermore methods of teaching stood to gain by being set in the context of the environment. The environment is itself a source of instruction as valuable as the traditional subjects in educating mankind.

81. Again, since the environment is a system of complex relationships involving a wide range of factors, teaching it should lead, not to the establishment of yet another discipline, but to the pluridisciplinary approach which teachers now acknowledge as a necessity.

82. From the spider's web to the design of dams and bridges, from nature's geometrical forms to Gothic rosettes, from the structure of molecules to geodesic domes, from coloured microtomic sections to abstract paintings, the economy and purposefulness of nature and of man-made forms can be demonstrated to children at all levels, thus helping them to acquire a sense of beauty, harmony and balance.

83. When curiosity has been whetted by the spectacle of nature, the mind opens wider: in contrast with the situation today, when education seems only too often designed to canalize curiosity - the motive force of learning - the child becomes more observant, ready to approach and assimilate the beauty of nature, the product of ecological balances - like the beauty of monuments, the result of striking a balance between form and function, between heaviness and strength, between traction and compression, between

materials and climate. The child is also encouraged to create things for himself.

84. There is no disguising the fact that such a course, bringing to the forefront the need to preserve and develop the quality of the environment through the education, in the broad sense of the term, of all the people who are to use that environment, entails changes in educational systems. These changes will, of course, reflect the individual outlook of each nation and the characteristics of its educational system.

85. What seems desirable in any case is to develop a new, genuinely ecological education, better fitted to the changing world which tomorrow the child will have to confront and transform. Moreover the process of learning and building up the body of human knowledge may well change radically in nature over the coming years. The development of data-processing techniques, which is now taking place alongside the exponential increase in documentation, already hints at the emergence of working methods wherein memory-training will be of less account than a consistent ability to formulate problems in a logical context while leaving plenty of scope for imagination.

### Training of decision-makers

86. Like education, the training of environmental specialists is now in process of evolution. The gaps to be filled vary from country to country but are still wide, either because the latest ideas have as yet been incorporated in curricula only superficially or not at all, or because certain professions so far exist only on paper. In this connexion it is to be hoped that the training in ecology given to engineers and administrators can be developed faster, and that a genuine system of ecological instruction can be organized to train specialists who can relate the various natural settings to the various human activities so as to rediscover a sense of the unity of things and beings. Of course, such specialist training must be organized according to carefully planned requirements and employment opportunities.

87. Equally important, clearly, is the work of all those who, in one degree or another, have a responsibility for shaping and administering the environment - certain types of engineers, architects, town-planners and other planners, administrators at all levels, the leaders of professional social groups, and so on. Here training might be given by introducing general notions of major environmental problems into the training curricula for all these professions, by holding refresher courses, etc.

Middle-level training

88. Permanent arrangements should be made for the training of personnel directly involved in activities in favour of the environment, especially in regions where the people live by activities dependent on natural resources, such as fishing, hunting, tourism and extractive industry.

Teacher training

89. Lastly, the training of teachers at all levels - the foundation of all education and occupational training - should receive special attention. It must be emphasized that the teachers should be, not the repositories of a new "environmental science", but instructors and research workers convinced of the need for the inter-disciplinary approach already mentioned.

## C. Information

90. The function of public information on environmental problems is to supplement formal education and to provide background material relating to situations which the citizen will have to face and decisions which he will have to take in the course of his participation in public affairs. The dissemination of information shapes public opinion and awakens it to the problems of the environment.

91. The exchange of experience, in all its forms, is also a vital investment. All too often experience rich in the lessons of success or failure remains unknown, so that some are deprived of a source of inspiration and others are left to make virtually the same mistakes all over again. No opportunities for such exchange - seminars, exchange of specialists, secondment, etc. - should be neglected, and monographs, textbooks, audio-visual material, standard works, periodicals and information leaflets should be given the widest circulation. Such activity would link up with and reinforce existing or newly created systems of information exchange and the network of observatories which is obviously needed to monitor disturbances of the environmental balance.

92. Voluntary associations for the protection of the environment and the defence of users and consumers should be able to play an active part - an arrangement which, furthermore, would favour the practice of democracy. They should be granted the necessary funds and access to the mass media.

93. The State also has a part to play, both in countries where radio, television and newspapers are privately owned and in countries where these media are subject to more or less strict governmental control. The State is the custodian of the general interest and, in that capacity, strikes the desired balance between the aspirations of the greatest number and the de facto power of the few.

## D. Political and institutional action

### Attitudes and options

94. Every act of environmental arrangement, every intervention in the relations between man and his environment, and every assessment of the values at stake in any appraisal of the quality of the environment implies decisions of a political nature, which vary with the economic and social structure of the country concerned. A decision relating to the conservation or restoration of the landscape or of economic resources is political, for it affects the social groups with interests in the existing or vanished balance and the agents who neglect or attack it. The arguments advanced on both sides are political, for they can readily be attributed to the ideologies put forward or recognized as conservative, progressive or revolutionary. Even the definition of concepts is political, as witness the different method of calculating the social cost of pollution in the centrally planned economies and the market-economy countries. The former regard that cost as a charge on the whole community; the latter do not always share this view owing to the complexity of the power relationships involved.

### Conflicts of interest

95. It is easy to say that the political authorities are the custodians of the general interest. The idea of conflict between private interests and the interests of the community, when applied to environmental problems, is fertile but inadequate; sometimes private interests are shared by the whole community. It is often the community that decrees or accepts the destruction of particular resources according to criteria of profitability, or scales of reference, which are those of the leaders. Often the conflict is between divergent interests of the same individuals, and the chief difficulty seems to lie in making sure that interests difficult to define and difficult to assess in quantitative or financial terms are taken into consideration.

### The legal rules

96. One political aspect, in the highest sense of the term, is inseparable from the body of legal rules which is met with in practically all the areas mentioned.

For every aspect of the preservation and advancement of mankind there is a corresponding aspect of law: in the case of over-population, the rights of the person are involved - the right to life, which immediately raises the question of contraception, abortion and eugenics; in the case of housing, the town-planning laws; in the case of mobility of the population, the status of aliens or the rules of conflict of laws. Economic inequality generates a right to development. All these matters have far-reaching ideological implications which depend on the political regime chosen and the prevailing philosophies and religions.

Rights and obligations of ownership

97. Even the question of appropriation of material goods is far from completely settled; and many aspects of the matter still to be resolved raise serious political problems. The definition of "things" subject and, things not subject to appropriation requires further clarification. For instance, the legal procedure for taking possession and, in particular, rights of user in the broad sense make it desirable to reconsider the prerogatives of the owner - individual, private company or public body - from a new angle. The limits to these prerogatives need to be examined, in the light of the necessities of an environmental policy, from the standpoint of content and from that of sanctions. New aspects of the problem are emerging: much thought has been given to the right to destroy (abusus), but the right to abandon has been neglected. The litter problem, for example, calls for regulation.

Participation of individuals and groups

98. Individuals, in isolation or in organized groups, have an active political part to play in keeping with the elementary requirements of democracy. Firstly, by bringing pressure to bear on the political leaders they can cause decisions to be taken and see that they are carried out. Secondly, by their behaviour as well-informed consumers they can head off production trends harmful to the environment. Lastly, they can participate directly in the protection or improvement of the environment by taking the initiative in monitoring and in arousing public opinion.

State action

99. However it must be emphasized that the State can play the leading role in fashioning a harmonious life-setting. The State can set an example of architectural and artistic creativity by erecting public monuments and buildings for social purposes which nobly express cultural values, and by stimulating all forms of social

communication - radio, television, the cinema, the theatre and public ceremonies - whereby artistic and cultural values may constantly be communicated to the greatest possible number of people.

100. The State can also set an example of preservation of the main natural aesthetic and historical assets of the physical environment by giving them better protection. The most outstanding should be defined, inventoried and placed in public safekeeping. Moreover the conservation of natural resources and landscapes is one of the basic principles of all social planning, and thinly populated open spaces of the kind that still exist in Africa and Latin America are an environmental feature of great value. Apart from their exceptional scientific interest, which has won some of them the status of national parks, and their attractiveness to tourists, they are a precious symbol of physical freedom, adventure and direct contact with nature. Lastly and above all, they are a potential reserve for forms of development and ways of life which are unrevealed to us but which the future may bring into being.

101. Again, the State can give a new impetus to town-planning policies by revising the current conception of the city in the light of the notion of environment: the city can be conceived as a system of relationships among its inhabitants, and between its inhabitants and the man-made world. Some of these relationships are economic, and integrate the city in the general economy of the region or country; others are of a symbolic nature and form part of a particular culture. Hence the endeavour to strike a balance within cities and between city and country.

102. In whatever field it chooses to intervene, the State clearly plays the decisive role as regards the environment. The actions of each State within its national jurisdiction will take the most varied forms, according to its own distinctive political inspiration. Consequently no attempt will be made here to describe, still less to recommend, particular forms of political action except on two points: as regards institutions and as regards international action.

## E. Institutional implications

103. In view of the complexity of intervention in environmental matters, to which attention has already been drawn, the adaptation of institutions must be recognized as an inescapable necessity. According to circumstances and the needs to be met, every State stands to gain by entrusting certain functions of reflection, stimulation, supervision and co-operation with other nations to a national authority.

104. Moreover, since the most direct impact of environmental problems is felt in the familiar setting of individual life - that is to say in the village, the district, the town or the region - it would be an advantage to organize, in the direction of greater simplicity, the forms of action to be approved and carried out at these various levels.

105. Many forms of action in favour of the environment require the joint efforts of several States: for example, the control of pollution of the seas, rivers and atmosphere depends upon clear-cut regulations vigorously applied. The establishment and operation of environmental observatories, the need for which will be more and more keenly felt, will entail pooling and processing the information recorded.

106. Furthermore international technical co-operation is clearly essential. For lack of competent specialists in the various environmental subjects, many countries would be unable to derive due benefit from the exchange of experience even if they managed to build up enough of a structure to participate profitably in that exchange. It is therefore desirable that countries which have reached a relatively high level of competence should render technical assistance, either by accepting trainees or, if practicable, by seconding specialists to serve in other countries for specific periods during the planning and initial action phase. States rendering such assistance would take care to avoid merely mechanical transfers of culture, the dangers of which have already been pointed out.

107. It is beyond doubt that the exchange of information and experience between Governments is one of the basic forms of environmental action, but it must be borne in mind that not all experience is interchangeable. Measures that have been found beneficial in some European country might produce less satisfactory results if transposed unchanged to an Asian country, for instance.

108. There is no doubt that contemporary problems and their solution will inevitably lead to greater closeness and, let us hope, towards the world unity which is one of the chief reasons for the existence of the United Nations. But unity must not exclude diversity of cultures and outlooks, a source of enrichment for all and a prerequisite of mutual understanding. Unity is not necessarily to be reached through standardization.

## Chapter IV

## RECOMMENDATIONS FOR ACTION

### A. Continuous social diagnosis

109. A large mass of data is already available in all countries on the environmental situation and its social implications, and in particular on the resources available (natural resources, housing, services, cultural heritage, etc.) and their utilization and distribution (behaviour patterns, degrees of satisfaction, etc.). Merely to collect the most useful data would be enough to allow a first assessment to be made of the situation and would provide the requisite rational grounds for the choice of policy priorities (identification of crucial needs) and for educational action (the collation and interpretation of knowledge).

#### (i) Recommendations for national action

110. *It is recommended that* the attention of Governments should be drawn to the need to adopt the following measures:

- the periodic preparation of a *national report* on the state of and outlook for the environment, after careful study of the specific national needs for information on this subject and with due attention to the goals of economic planning and programming;
- the strengthening and co-ordination of *action in progress* with regard to:
  - . the institutional organization of environmental monitoring from the social and cultural standpoint and, in particular, the establishment of social and economic programmes for monitoring the development of the situation, making use of existing institutions
  - . the selection of social and cultural indicators of the environment
  - . the setting of standards and criteria for the quality of life, after a forward-looking study, *inter alia* by inquiry, of the socially desirable minima for certain social, economic and cultural parameters and indicators of the environment
  - . an analysis of the *conflicts* between *private* interests and the *public* interest in the use of the environment, and a study of institutions and planning methods for resolving such conflicts in the short and long term.

(ii) Recommendations for international action

111. It is recommended that the Secretary-General should make arrangements:

- for the United Nations system to provide countries on request with the necessary technical assistance in preparing national reports on the environment, in setting up machinery for monitoring environmental developments from the social and cultural standpoint and, in particular, in drawing up national social and economic programmes;
- to study the desirability of a project for continuing co-operation among national social and economic programmes in an international network. The organizations of the United Nations system, including the regional economic commissions, would be called upon to participate in this activity, and so would other international governmental and non-governmental agencies;
- to organize the exchange of information on experience, methods and work in progress in connexion with the continuous social diagnosis, particularly at the regional level and between regions with common problems;
- to prepare, on the basis of the national reports on the state of and outlook for the environment, periodic reports on regional or sub-regional situations and on the international situation in this matter.

The activities described above could be co-ordinated by the new bodies for environmental co-ordination.

B. Educational action

112. Education and training on environmental problems are vital to the long-term success of environment policies because they are the only means of mobilizing an enlightened and responsible population and of securing the manpower needed for practical action programmes.

(i) Recommendations for national action

113. It is recommended that the attention of Governments should be drawn to the need to adopt the following measures:

- at the school level, a thorough revision of curricular to adapt them to modern methods of teaching. Besides introducing new material into certain subjects more particularly concerned with the environment (natural sciences, physical and human geography), it will be necessary to encourage an ecological approach: i.e. to forge inter-disciplinary links between the various subjects taught and, in particular, to use active and integrated methods of teaching - field excursions, open-air centres, country classes for town children, simulation of cases based on local examples, audio-visual aids, etc. - calculated to prepare the students for participation. These experiments in teaching should not neglect the pre-school level. For the training of intermediate-level technicians, training institutions will have to be established or adapted to suit the widely varying needs of different countries;

- At the university level, intensification of the training of specialists in the basic disciplines of environmental management and of administrators specializing in the management of pluridisciplinary systems, after a careful survey of requirements and possible markets for their services. The appropriate university courses should be instituted or brought up to date in order to deal with current problems. As to the administrators specializing in the management of pluridisciplinary systems, it may be thought appropriate that people already qualified in a suitable basic discipline should be professionally trained to take charge of teams for the study and management of systems of interdependent activities concerned with the environment, such as the integrated development of an urban complex, the development of a river basin or the integrated study of a region's potentialities;
- Adaptation of the training for the members of all professions involved in environmental planning:
  - . Firstly, professional people who act directly upon the environment, such as engineers, architects, town and physical planners. It would be necessary to introduce into the existing curricula of training for these professions a set of general notions on the main problems of the environment, together with advanced training in the environmental management techniques associated with each of the professions concerned
  - . Secondly, professional people such as economists, administrators, planners, political leaders and trade union officials, whose functions involve them in indirect action upon the environment. These should be given a general training through seminars or suitable *ad hoc* courses;
- Arrangements for permanent training for the members of all the professions mentioned, in view of the very rapid evolution of environmental problems and knowledge;

- intensification of extra-mural educational activities relating to environmental management, particularly for rural populations who live by agriculture, animal husbandry and forestry and who thus have a large proportion of biological resources under their management;

Adaptation of the training of teachers, at all levels, and community leaders to equip them for their duties as redefined in the foregoing proposals.

(ii) Recommendations for international action

114. It is recommended that the Secretary-General, the organizations of the United Nations system, especially UNESCO, and the other international agencies concerned should take the necessary steps to establish an international programme of technical and financial co-operation and assistance in the sphere of general education in favour of the environment and the training of the necessary specialists, technicians and teachers. The exchange of information on systems for teaching environmental subjects and, in particular, the dissemination of the results of educational experiments are an essential feature of such international co-operation.

115. It is further recommended that UNESCO, as part of the Programme on Man and the Biosphere and in the course of its general educational activities, should develop its activities concerned with the study of innovations in general education and in specialist training and should encourage the institution of courses and training periods at the regional and international level.

116. Lastly it is recommended that international organizations for voluntary service and, in particular, the International Secretariat for Volunteer Service should include environmental skills in the services they provide, in consultation with UNDP through the United Nations Volunteer Corps.

C. Public information and participation

117. It is impossible to enlist the participation of the public in environmental management without a sustained effort, parallel with the educational campaign, to disseminate information and to develop appropriate institutional machinery. If the citizens are to exercise their responsibilities, they must be not only aware and motivated but also sufficiently well informed of the immediate and long-term problems. All modern techniques for imparting information can be used in making known events and phenomena which affect the environment.

- individual participation is exercised mainly through the normal political process, through a continuous dialogue with the planners and community leaders, and through access to the mass media;

- The solution of environmental problems - which are essentially collective problems but at the same time call into play qualitative notions that are necessarily subjective - is particularly dependent on community forms of social and cultural development. These provide a setting in which to engage in a dialogue for the purpose of defining and giving practical expression to social preferences, and they release latent capacity for action.

(i) Recommendations for national action

118. It is recommended that the attention of Governments should be drawn to the need to adopt the following measures:

- participation in maintaining the flow of information on the environment by all available means (dissemination of the main data collected by public authorities in the form of national reports; local and national campaigns, etc.) and the use of the mass media to educate the public, particularly the rural population, on those subjects;
- the establishment of information machinery and machinery for the co-ordination of public responsibilities for education, training and information;
- increased public participation in the main channels of mass information;
- active encouragement of community activities favourable to the creation of a "good environment", particularly youth activities (in specialized or non-specialized associations, out-of-school establishments, etc.), by providing continuous material support and adequate facilities (e.g. open-air centres with trained staff);
- adaptation and operation of public agencies responsible for environmental management so as to provide for greater participation, and to that end reform, if necessary, of the structure of urban and rural local government.

(ii) Recommendations for international action

119. It is recommended that the Secretary-General should make arrangements:

- to give the widest possible circulation to the preparatory documents and official documents of the Conference. This task might be performed by the new bodies for environmental co-ordination;
- to establish a programme of information on the environment, to be run by a United Nations co-ordinating body in consultation with the national, sub-regional and regional services concerned, for the purpose of assisting States in their

efforts to inform the public about current activities and about the solutions applied to environmental problems. In addition this body would compile a catalogue of the methods available in connexion with:

- television programmes on the environment suitable for international transmission
- radio programmes and popular newscasts for illiterate or semi-illiterate audiences
- technical experience in the dissemination of information to various sections of the public (information systems in rural areas, information for schools, etc.)

- to develop technical co-operation, particularly through and between the United Nations regional economic commissions.

120. It is also recommended that the Secretary-General and the development agencies should make arrangements to use and adapt certain international development programmes so as to improve the dissemination of information and strengthen community action on environmental problems.

## D. Conservation and creation

121. The biological and cultural heritage must be rationally managed in order to ensure the continuity of development; consequently a large share of resources require dynamic protection. This applies, in particular, to over-exploited species, rare and outstanding natural habitats, landscapes and monuments, and minerals or fossil fuels of which only limited quantities are available.

122. Social and cultural development is expressed by a new planning of the environment and, in the extreme case, by the creation of an entirely new environment. Certain key sectors in which development possibilities are most evident, and areas in which there appears to be a pressing need for development, deserve special attention.

### (i) Recommendations for national action

123. It is recommended that the attention of Governments should be drawn to the need to adopt the following measures:

- the reflection, in social and economic policies, of concern for conservation, in particular of the most valuable features of the environment anywhere in their territory (monuments, sites, rural and urban landscapes, interesting ecological settings, threatened species of fauna and flora, high-quality resources of water and open space, etc.), with due attention to the possibility of signing various international conventions on conservation (enumerated below in the recommendations for international action);

- the launching or continuation of pilot schemes based on participation, and mainly:
  - . the creation and progressive improvement of reception areas for large numbers of migrants from the countryside to major urban areas in the developing countries;
  - . the creation of urban centres designed to meet human needs and to strengthen the development of a national culture which draws heavily on the past and on innovation;
  - . a completely new approach to the tourist trade, based on developing it for the real benefit of the local population, on respect for and discovery of the local culture by visitors, and on due attention to ecological data.

(ii) Recommendations for international action

124. It is recommended that Governments, with the assistance of the Secretary-General, FAO, UNESCO and the other international and regional intergovernmental and non-governmental agencies concerned, should continue the preparation of the conventions required for the conservation of the world's natural resources and cultural heritage (monuments, groups of buildings and sites; wetlands of international importance; island ecosystems still undisturbed by human activities; species of wild animals and plants, etc.). In the course of this preparatory work, Governments should consider the possibility of putting into operation systems of protection for elements of the world heritage, under which those Governments that wished to save elements of their heritage of universal value would be able to obtain a contribution from the international community to their efforts if need arose.

125. It is also recommended that if the draft conventions listed below are already open or are hereafter opened for signature, Governments should make arrangements to examine them with a view to signature:

- Draft convention on conservation of the world heritage;
- Draft convention on the protection of monuments, groups of buildings and sites;
- Draft convention on conservation of wetlands of international importance;
- Draft convention on conservation of certain islands for science;
- Draft convention on export, import and transit of certain species of wild animals and plants.

126. Lastly it is recommended that the Secretary-General should make arrangements:

- to be kept informed of national pilot schemes for new forms of environmental education
- to assist countries, on request, with their experiments;
- to organize the international exchange of information collected on this subject.

## E. Exchange of information

127. In planning the Conference, the exchange of information about the environment has been a central consideration. Indeed the Conference is itself partly an information gathering and analysis activity in bringing together lines of thought and sources of information, many of which have not previously been in contact.

### (i) Recommendation for national action

128. It is recommended that the attention of Governments should be drawn to the need for action to develop and strengthen existing information networks concerned with environmental problems.

### (ii) Recommendations for international action

129. It has been widely recognized that the development of international recommendations for the improvement of information exchange is difficult because of the diversity of subjects and the variety of users. Discussions in the Preparatory Committee for the Conference and contributions from experts have touched on many problems including those of access to relevant sources of information and of the rationalization of existing information systems. There was also concern over the need to develop techniques for handling socio-economic information and for identifying the real needs of users and in particular of decision-makers.

130. As the tasks are so great, only one of these problems could be chosen at this time as suitable for immediate attack at the international level. It was recognized that there are many initiatives to promote the networking of existing information systems so as to increase their usefulness and to avoid the unnecessary duplication of effort. Because of these initiatives, access to sources of information was identified as the most important problem to be tackled as a beginning and proposals were developed for a modest International Referral Service for sources of environmental information. Such a service would enable the maximum benefit to be gained from the exchange of information about local, national and international research, application, and legislative and management experiences in environmental matters.

131. The users of the Referral Service would be governments and bodies of the United Nations system. The Service could be gradually extended to other users, subject to the availability of financial resources. The Service would provide addresses and descriptions of those sources of information most likely to be of help to the user. For developing countries, the Service would provide help in the formulation of questions to the Service and the interpretation of the answers.

132. The Referral Service would cover the five substantive subjects of the Conference agenda: planning and management of human settlements for environmental quality; environmental aspects of natural resources management; identification and control of pollutants and nuisances of broad international significance; educational, informational, social and cultural aspects of environmental issues; development and environment; and, on the other hand, should catalogue all relevant governmental and international sources of

. data
. technological and scientific information
. social and economic information
. legislative, administrative and policy information
. public information.

133. The Referral Service would collect, with the assistance and advice of Governments and of the bodies of the United Nations system, the entries which will form its working catalogue of information sources. Each entry to the catalogue would contain the name, address, cable and telephone number of the information source, together with details of controlling body, function, subject coverage, services and availability. These attributes would be sufficiently categorized, indexed and annotated to ensure efficient retrieval.

134. It is now usual for this type of catalogue to be held in a computerized form as this assists up-dating, avoids the need for tedious sorting of entries into alphabetical order, speeds up and extends the capacity for searching and keeps down the requirement for specialist staff. Entries on sources of information would be written on well-designed input forms and categorized, indexed, and edited before being stored electronically. The requests of users would then be organized by the staff of the Service into a search strategy and matched by computer against the content of the catalogue file. The resulting output for the user would consist of a computer print-out listing the sources of information selected for the user's particular requirements. In

addition to this customized service it would be possible at a later stage for the Referral Service to publish, on magnetic tape or in book form, edited catalogues covering national, regional, international or subject-based areas of interest.

135. The survey by the Conference secretariat of the relevant information gathering and disseminating systems of United Nations bodies and of some of their clients has shown that an initial catalogue of sources of information could be easily assembled with the assistance and advice of governments. Consultations with the International Computing Centre have shown that the right kind of modern computing facilities for the Referral Service are present in Geneva and that an appropriate terminal is housed in the Palais des Nations. The facilities required by the Referral Service would be well within the existing capacity of the International Computing Centre, whose activities are already paid for in respect of United Nations bodies and would not be charged to the Referral Service. The additional costs of the Referral Service to the United Nations would, therefore, be modest and would only have to cover four to five professional staff with subject knowledge, one information scientist, two reference specialists to formulate questions in the carrier language or languages of the system, one keyboarder and a small clerical support staff.

136. Because the real needs of users and the usefulness of the information they obtain are the only valid starting points for promoting information exchange, it would be necessary to ask users to report back to the Referral Service on which of the information sources they were given were relevant. A well worked out methodology exists for this kind of evaluation. With this feedback, the Referral Service would develop an awareness of the functional network of use which exists between users and producers of information and this knowledge would provide the realistic basis for a more ambitious attempt to co-ordinate information exchange in the future.

137. Accordingly, it is recommended that the Secretary-General take action to implement an International Referral Service for sources of environmental information according to the model described in the previous paragraphs, in order to assist in the successful implementation of all the recommendations included in this Chapter IV subject area IV and of most of those recommendations envisaged within the other four substantive subject areas of the Conference agenda.

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# United Nations
# Conference on the human environment

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# Development and environment

(subject area V)

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# DEVELOPMENT AND ENVIRONMENT

## (Subject Area V)

## Report by the Secretary-General

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## INTRODUCTION

1. The environment has only recently become an issue of public concern on a global scale. Environmental concerns first arose in the industrialized countries as these countries became more conscious of the adverse effects of some forms of development and technological change on the environment. Many in the developing countries questioned the relevance of this new concern for the environment to their own compellingly urgent development priorities. It was in an attempt to define the relationship of development to environment that a panel of twenty-seven senior experts from all parts of the world was convened by the Secretary-General of the United Nations Conference on the Human Environment, at Founex, near Geneva, from 4 to 12 June 1971. The panel's deliberations resulted in a Report on Development and Environment (the "Founex Report").

2. The Founex Report attempted to place the growing environmental concern in its proper developmental perspective in the context of the urgent and pressing needs of the developing countries. It also aimed at creating a better understanding of the problems of the poorer parts of the world in order to develop the framework for a reconciliation of perspectives, and at focusing attention on the opportunities for a beneficial and growing partnership between the less industrialized countries and the industrialized world.

3. The basic ideas expressed in the Founex Report were tested in a series of regional seminars: ECAFE, at Bangkok (17-23 August 1971); ECA, at Addis Ababa (23-27 August 1971); ECLA, at Mexico City (6-11 September 1971) and UNESOB, at Beirut (27 September - 2 October 1971). The report received a strong endorsement at these seminars becoming, in fact, the focal point for the concerns of the less industrialized countries.

4. The recommendations for action included in this paper were conceived within the framework of the Founex Report. A brief summary of the Founex Report is given in chapter one of this paper while the Report itself is attached as annex I. Annex II contains the basic issues of the report on environmental problems of developing countries of the Working Party convened by SCOPE with the support of the secretariat of the Conference in Canberra from 24 August to 3 September 1971. A summary of the recommendations of the regional seminars is also annexed.

5. This paper is principally concerned with the environmental problems of the less industrialized countries. It would be wrong, however, to regard its conclusions as inapplicable or irrelevant to the industrialized countries. The industrialized countries also have their own pockets of poverty and face similar decisions in the management of resources in yet underdeveloped areas. While all countries share environmental problems resulting both from underdevelopment and from the process of development itself, differences may exist in the nature and magnitude of these problems at different stages of development. The Founex report showed that although conflicts between development and environment may arise, they are not necessarily inevitable or inescapable and that through proper planning developmental and environmental measures can be harmonized in such a way that they become mutually supporting. The interest of developing countries in the environmental issue derives from three basic factors: that their interests will be affected by actions taken by industrialized countries to deal with their environmental problems; they have their own environmental problems arising primarily from poverty and underdevelopment; and they share the concern of all mankind for the preservation and care of the common resources of the oceans and the atmosphere. In the final analysis, the purpose of the paper is to demonstrate the close relationship between development and environment, and to underline the universality and indivisibility of these two concerns as well as the international responsibility for both.

## Chapter I

## STATEMENT OF ISSUES

6. The concern for environment is, for the less industrialized countries of the world, essentially an aspect of the concern for development. Although these countries are experiencing, in varying degrees, the environmental problems that emerge in the course of growth and transformation, they are for the greater part beset by the problems of inadequate development. These are essentially the environmental problems of poverty - problems of unsafe water, malnutrition, inadequate housing and sanitation, ill-health, and natural disasters. Moreover, these problems are not of a static kind. Recent history suggests that in many countries they are likely to worsen as populations grow rapidly and impose increasing pressures on urban and rural areas. In fact, the environmental problems in some urban areas of the developing countries are becoming as severe as those as those in the industrialized countries, in addition to being compounded by the existence of mass poverty.

7. The solution to the environmental problems of poor societies is to be found in the process of development itself: development is a cure for most of these problems, rather than their cause. Only the process of development can remove many of the factors which at present endanger not merely the quality of life but threaten life itself in many parts of the developing world.

8. While development is a necessary precondition for overcoming many of the environmental problems of poor societies, this is not to say that such problems could be automatically and spontaneously resolved, by the mere acceleration of economic growth. These is, on the contrary, ample evidence to suggest that certain patterns of economic growth could bring in their wake not the solution but the aggravation of acute social and environmental problems. Historically, economic growth has in many cases been accompanied by rising unemployment, greater inequality, and increasing poverty and ill-health for large sections of the populations of the developing countries.

9. There is thus an increasing awareness of the limitations evident in the narrowly-focused pursuit of the goal of raising GNP. This is reflected in the efforts now being made in the United Nations to formulate a comprehensive approach to development. The International Development Strategy for the Second Development Decade has already emphasized the need for greater sensitivity to social and other objectives in the

development process. It is appropriate, therefore, that attention should also be called at this time to environmental factors. Environmental goals should also become an integral part of the multiple dimensions of development strategy.

10. This raises a number of difficult conceptual and practical issues, however. In each of the subject areas of the Conference - human settlements, natural resource management, pollution control and social and cultural factors - a host of problems were identified and a number of recommendations were proposed. These are of varying importance and would make claims of different magnitude on the limited financial and human resources of the less industrialized countries. It would clearly not be valid to argue that environmental problems, whatever their character, should merit a prior claim on resources, irrespective of other urgent and compelling needs. There is need for establishing priorities in the choice of programmes and policies in a manner that reinforces or complements the development process.

11. The establishment of such priorities is perhaps the major conceptual and practical issue of relevance to the development planning process. It is an issue that can be resolved in specific terms by each individual country, in the light of its own conditions and objectives. But whatever the individual situation of countries may be, the problem should not be viewed as one which involves a simple trade-off between environmental goals, on the one hand, and economic goals, on the other. The need for such trade-offs will undoubtedly arise in specific instances, but the problem is basically one of devising a pattern of development in which environmental objectives go hand in hand with economic, social and cultural goals, of identifying and acting upon the complementarities rather than the conflicts between multiple objectives.

12. There are essentially two major aspects to a more integrated and unified development strategy that incorporates environmental objectives. The first of these would involve an attack on the environmental problems that beset poor societies - an attack, in other words, on mass poverty and ill-health. A pattern of development which is oriented towards employment creation, better income distribution and the provision of essential necessities especially environmental sanitation and minimum consumption levels to the vast mass of the population will be more consistent with environmental objectives than a pattern which neglects these factors.

13. The other aspect of an integrated development strategy relates to the need for an awareness of the environmental problems that can arise - and have in the past arisen - in the process of growth itself. These problems frequently can be mitigated if not avoided by sound planning and policies based on better knowledge of the underlying facts and processes. Agricultural growth and transformation, for example, involves the construction of reservoirs and irrigation systems, the clearing of forests, the use of fertilizers and pesticides and the establishment of new communities, activities that, however necessary for development, can have adverse environmental implications. Similarly, by-products of industrialization often occur as wastes which foul the water, air and land when their disposal is unplanned or unregulated. Again, the growth of transport and communications systems and the process of urbanization has consequences for the ecological system. Some of these environmental problems may be even more pronounced in the less industrialized than in the industrialized countries which lack the resource base necessary to provide even basic environmental safeguards.

14. At the same time, development invariably involves the increased and intensified exploitation of natural resources and the expansion and creation of human settlements, which can have deleterious environmental side-effects. The less industrialized countries cannot forego growth and transformation in the name of conservation of natural resources or for the sake of preserving an unaltered natural habitat. Actions taken to protect the environment by diverting resources from development might in the long run prove to be self-defeating, since they might reduce development thereby limiting the magnitude of resources ultimately available for improving the human environment. Development strategy can be so designed as to ensure that unfavourable impacts on the environment are avoided or, at least, minimized. This is where the less industrialized countries can benefit by studying the experience of the industrialized countries and particularly, their mistakes.

15. Most of the issues concerning development and environment are of a national character. But some have important international implications. In fact, environmental issues are likely to play a growing role in international relations, both political and economic. Actions designed to deal with these issues are not only competing strongly for the resources of industrialized countries, but may increasingly influence the pattern of world trade, the international distribution of industry, the competitive

position of different groups of countries, their comparative costs of production, and transfers of technology. The less industrialized countries are vitally concerned that the net result of all these developments be positive and beneficial rather than negative and harmful. Growing national concern over the effects of air and water pollution, coupled with the fact that they can transcend national boundaries, creates the potential for new areas of conflict among nations. It is therefore essential that all countries recognize the possible effects of their activities on the environment of other nations and take steps to control them - in order to avoid harmful effects on third countries.

16. Not enough information is available at present to say with any degree of certainty what the net impact of environmental concerns is likely to be on international economic relations. There are both areas of concern and prospects for new opportunities. For example, environmental standards adopted by industrialized countries could have an adverse impact on exports of other nations. Concern has been expressed that tariff or non-tariff barriers may be erected in some industrialized countries to protect their industries against competition from countries whose industries may not have to bear the same burden of anti-pollution costs. The development of low-pollution technologies and the resulting increased recycling of materials and products may reduce the demand for certain primary products from the less industrialized countries. New technologies designed to mitigate pollution may turn out to be significantly more expensive than the present technologies and the less industrialized countries may have no alternative than to buy them whether or not they require them. In addition, there is concern among the developing nations that resources otherwise available for development , assistance may be diverted to environmental programmes within the industrialized world.

17. Some of these apprehensions may be legitimate. Others may reflect no more than the inherent fears of the weak in any confrontation with the stronger members of the international community. It is important, however, that the issues involved be widely discussed and studied to ensure that international understanding and agreements be reached to deal with these concerns.

18. It is equally important that consideration be given to the new opportunities which may be offered to the developing countries. It is possible for example that the current concern with pollution associated with some synthetics may encourage a

return to certain natural products. Or that the less industrialized countries may acquire a comparative advantage in certain industries whose costs of production in the industrialized countries may rise significantly because of pollution controls. Or that low pollution technologies based on reuse of traditional wastes may actually lower costs of production for some products.

19. A sensible international strategy would be to minimize the adverse implications and maximize the opportunities of environmental concerns so as to achieve a net beneficial impact on the economic relations between the less industrialized countries and the industrialized world.

20. One of the principal questions that arises from the increased concern with the human environment is what the cost to achieve various higher levels of environmental quality will be - since our knowledge of the magnitude of those costs is still limited at present - and how the costs should be distributed among the nations of the world. Developing countries are understandably concerned that, because of their inherently weak position in international trade and control of technology, they may be forced to bear an unfairly heavy share of these costs. Will the growing awareness of the concepts of "one earth" and "one environment" in fact lead - as it should - to the nobler concept of "one humanity", and to a more equitable sharing of environmental costs and a greater international interest in, and responsibility for, the accelerated development of the less industrialized world? Or will it become a narrow concern of the industrialized world, leading to many awkward confrontations with the developing countries rather than to a new era of international co-operation?

## Chapter II

## RECOMMENDATIONS FOR ACTION

21. Most action designed to preserve and improve the environment are necessarily national in character. This is particularly true in the management of human settlements and natural resources. On the other hand, action in other areas, such as marine pollution, can only be taken effectively through international co-operation at the regional or global level. This paper includes only those recommendations for action which are closely related to national development planning and to international economic relations, since other subjects cover recommendations regarding the major sources of national and international environmental degradation.

### A. Recommendations for national action

#### (i) Formulation of a new dimension to development strategy

22. The concern for an improved human environment has emerged at a time when the less industrialized countries are already feeling disillusioned with the pursuit of narrowly conceived economic growth. This affords an opportunity to treat environmental concerns as an added dimension of planning, and not merely as a further claim on limited resources, and to formulate a new strategy of development centred on the elimination of mass poverty and on the creation of a decent human environment. While each country must define its strategy in the light of its own particular problems and stage of development, some of the main elements of such a strategy can be identified.

23. It is recommended that in formulating strategies for development, the attention of governments be drawn to the need to take account of the following elements:

- development policies should include a selective attack on the worst manifestations of poverty. Development goals and targets should be expressed in terms of a progressive reduction and eventual elimination of malnutrition, disease, illiteracy, squalor, unemployment and inequalities. While the GNP may serve as a convenient summation of all other targets, greater attention must be paid to its content and elements;

- consumption targets which could be reached in a reasonable period of time should be set. Those targets should be expressed in terms clearly directed to achieving environmental conditions basic to human health and well being by eliminating the worst manifestations of poverty, such as nutritional, educational, health and housing deficiences. Environmental criteria should also be established for various sectors, such as health, nutrition, water supply, sanitation, soil conservation, land management, rural-urban interaction patterns, and the location and planning of new urban settlements;

- appropriate machinery should be set up to deal with environmental problems and should be integrated, or closely linked with the machinery for overall development planning and implementation;
- specific environmental goals should be incorporated in the process of regional and physical planning.

(ii) Formulation of guidelines for project appraisal

24. The integration of environmental goals with development policies will also involve a revision of guidelines for project appraisal, to take account of environmental considerations. More particularly, decisions will be required on what social costs or benefits should be considered, how they should be measured, and at what rate future costs or benefits should be discounted.

25. It is important to ensure that such new guidelines are appropriate to conditions prevailing in the countries concerned and formulated at the national level. They should not be established in abstract or general terms. Their relevance or applicability should not be assumed but should be demonstrated on a case by case basis. The formulation of appropriate appraisal and evaluation criteria will take time, and care must be taken that the flows of international aid and investments are not slowed down in the interval through the application of criteria established by multilateral or bilateral donors without adequate consultations with the less industrialized countries.

26. The establishment of adequate procedures for project design and appraisal presupposes a better knowledge of the environmental impact of development projects. Environmental pre- and post-audits of such projects are, therefore, often necessary to feed those in charge of projects with adequate data so that preventive and remedial action can be taken. Post audits should be supported, when necessary, by financial and technical assistance from international agencies.

27. It is recommended that the attention of governments be drawn to the need for action to ensure that:

- Governments take the initiative in establishing environmental guidelines and criteria for project appraisals;
- Governments in formulating these guidelines, seek the assistance, if necessary, of outside agencies concerned with development;
- the guidelines be discussed at a later stage at the regional and international levels to achieve a broad consensus.

(iii) Collection of basic information

28. The successful integration of environmental and developmental concerns will require a good deal of additional information which is not presently available to development planners.

29. It is therefore recommended that the attention of governments of the developing countries be drawn to the need to give priority to:

- conducting surveys of the present state of the environment and of the major hazards to which it is likely to be exposed in the process of development, to help determine environmental policies within the framework of economic and social planning;
- conducting studies and surveys to determine the extent to which the environment is affected by mass poverty, malnutrition, housing shortage, inadequate water supply, disease and illiteracy. These studies and surveys should be used in the formulation of social and economic plans;
- reviewing existing legislation available to implement national environmental policies and objectives, and determining what new legislative actions are necessary in light of this review;
- analysing studies and experiences of other countries which are developing environmental programmes and policies and are applying new administrative and technological approaches to pollution control.

B. Recommendations for international action

(i) Regional co-operation

30. The major role that United Nations and other regional organizations can play in helping Governments to establish an appropriate balance between the concerns of environment and development lies in organizing research, in training personnel, in arranging for the exchange of information and in providing technical and financial assistance above the levels indicated in the International Development Strategy.

31. Accordingly, it is recommended that regional organizations give full consideration to each of the following steps:

- preparing detailed plans for the study of major environmental problems faced by the countries of the region concerned as well as of the special problems of sub-regional and regional interest of the land locked and least developed countries of the region and of countries with coast lines particularly exposed to the risk of marine pollution;
- examining possible administrative, legal and technical solutions, to such problems in terms of both preventive and remedial actions, including alternative approaches to development projects;
- increasing and facilitating the flow of information and experience to member countries through global and regional co-operation with particular emphasis on an international information referral centre approach;
- establishing facilities for the exchange of information and experience between less industrialized countries which, although situated in different regions share similar problems as a result of common physical, climatic and other factors;
- encouraging training of personnel in the techniques of incorporating environmental considerations into developmental planning, and of identifying and analysing the economic and social cost benefit relationships of alternative approaches;
- establishing criteria, concepts and a terminology of the human environment through interdisciplinary efforts;
- establishing and disseminating information on the significant environmental problems of each region and the nature and result of steps taken to cope with them;
- providing and co-ordinating technical assistance activities directed at establishing systems of environmental research, information and analysis at the national level;
- assisting developing countries in co-operation with appropriate international agencies, in developing and applying low cost methods for improving health, housing, sanitation and water supply. Emphasis should be devoted to labour intensive measures and methods utilizing local materials.

(ii) International trade relations

32. In order to ensure that the growing concern with the environment does not lead to major disruptions in international trade, it is recommended that governments take the necessary steps to ensure that:

- all countries present at the Conference agree not to invoke environmental concerns as a pretext for discriminatory trade policies or for reduced access to markets and recognize further that the burdens of the environmental policies of the industrialized countries should not be transferred, either directly or indirectly, to the developing countries;

- where environmental concerns lead to restrictions on trade, or to stricter environmental standards with negative effects on exports, particularly from developing countries, appropriate measures for compensation should be worked out;

- the GATT could be used for the examination of the problems, specifically through the recently established Group on Environmental Measures and International Trade and through its general procedures for bilaterial and multilateral adjustment of differences;

- whenever possible (i.e. in cases which do not require immediate discontinuation of imports), countries should inform their trading partners in advance about the intended action in order that there might be an opportunity to consult within the GATT Group on Environmental Measures and International Trade. Assistance in meeting consequences of stricter environmental standards ought to be given in the form of financial or technical assistance for research with the aim to remove the obstacles that the products of developing countries have encountered;

- all countries agree that uniform environmental standards should not be expected to be applied universally by all countries with respect to given industrial processes or products except in those cases where environmental disruption may constitute a concern to other countries. Environmental standards should be established at whatever levels are necessary, to safeguard the environment and should not be aimed at gaining trade advantages.

33. It is also recommended that the Secretary-General ensure that:

- appropriate steps be taken by the existing UN organizations to identify the major threats to exports that stem from environmental concerns, their character and severity, and the remedial action that may be envisaged;

- the United Nations system assist governments in negotiating, in as many areas as possible, mutually acceptable international environmental standards on products so as to reduce the scope for arbitrary or discriminatory actions.

34. It is further recommended that:

- GATT and UNCTAD should consider undertaking to monitor, assess and regularly report the emergence of tariff and non tariff barriers to trade as a result of environmental policies.

(iii) International distribution of industry

35. The need of developing countries to establish certain basic industries (petroleum and chemicals, metal extracting and processing, pulp and paper and others) coincides with a growing concern of industrialized countries for the environmental degradation which rises from heavy concentration of such industries in their countries. These provide a new reason for re-examining the factors which determine the location of industries internationally, and, in turn, opens up new opportunities and new risks for developing countries. The capacity of the natural environment to absorb and dissipate waste without suffering intolerable damage must now be regarded as an economic resource. Since the less industrialized countries have by and large put lighter burdens on their environment resources than the industrialized countries and may therefore be able to afford less stringent environmental standards, this could give them a comparative advantage in the establishment of certain new industries. Such new activities could have a significant impact on development through increasing income, productivity and employment which would subsequently increase the ability of the countries concerned to improve the environment. However, countries in considering such opportunities should also take full account of the potential risk of environmental damage which might affect development gains. In many cases it should be possible to avoid or mitigate such risks by adequate planning, locations and use of proper technologies. In order to avoid the indiscriminate import of pollution, developing countries could enforce environmental standards to achieve minimal levels of industrial pollution in the light of their stages of development and of their cultural and social objectives.

36. In the light of the above, it is recommended that:

- Governments of the developing countries consider fully the new opportunities which may be offered to them to establish industries in which they may have comparative advantages due to environmental considerations, and that special care be taken in all such instances to avoid the creation of pollution problems in developing countries;

- the Secretary-General in consultation with appropriate international agencies, undertake a full review of the practical implications of environmental concerns in relation to distribution of future industrial capacity and in particular, to ways in which the developing countries may be assisted to take advantage of opportunities and to minimize risks in this area.

### (iv) International financing for environmental action

37. Environmental policies pursued nationally and internationally are likely to have repercussions on flows of resources and other factors affecting development. It is important that the Conference endorse the concept of international responsibility for the international aspects of environmental action.

38. Accordingly, it is recommended that the Secretary-General in collaboration with appropriate international agencies ensure that a study be conducted of appropriate mechanisms for financing international environmental action, taking into account the General Assembly resolution 2849 (XXVI).

39. Recognizing that it is in the interest of all mankind that technologies for protecting and improving the environment be employed as universally as possible it is recommended that the Secretary-General be asked to undertake studies in consultation with governments and appropriate international agencies to study means by which governmental technologies may be made available to developing countries under conditions which encourage their wide distribution.

### (v) International development strategy

40. It is recommended that the Secretary-General (in collaboration with appropriate international agencies) take steps to ensure that the environmental considerations set out here be taken into account during the review and appraisal of the International Development Strategy for the Second Development Decade.

# Annex I

## Development and Environment

Report of a panel of experts
convened by the Secretary-General of
the United Nations Conference on the
Human Environment [1]

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## DEVELOPMENT AND ENVIRONMENT

### A. Overall perspective

1. The current concern with the Human Environment has arisen at a time when the energies and efforts of the developing countries are being increasingly devoted to the goal of development. Indeed, the compelling urgency of the development objective has been widely recognized in the last two decades by the international community and has more recently been endorsed in the proposals set out by the United Nations for the Second Development Decade.

2. To a large extent, the current concern with environmental issues has emerged out of the problems experienced by the industrially advanced countries. These problems are themselves very largely the outcome of a high level of economic development. The creation of large productive capacities in industry and agriculture, the growth of complex systems of transportation and communication, the evolution of massive urban conglomerations, have all been accompanied in one way or another by damage and disruption to the human environment. Such disruptions have indeed attained such major proportions that in many communities they already constitute serious hazards to human health and well being. In some ways, in fact, the dangers extend beyond national boundaries and threaten the world as a whole.

3. The developing countries are not, of course, unconcerned with these problems. They have an obvious and a vital stake in them to the extent of their impact on the global environment and on their economic relations with the industrialized countries. They have also an interest in them to the extent that they are problems that tend to accompany the process of development and are in fact already beginning to emerge, with increasing severity, in their own societies. The developing countries would clearly wish to avoid, as far as is feasible, the mistakes and distortions that have characterized the patterns of development of the industrialized societies.

4. However, the major environmental problems of developing countries are essentially of a different kind. They are predominantly problems that reflect the poverty and very lack of development of their societies. They are problems, in other words, of both rural and urban poverty. In both the towns and in the countryside, not merely the

"quality of life", but life itself is endangered by poor water, housing, sanitation and nutrition, by sickness and disease and by natural disasters. These are problems, no less than those of industrial pollution, that clamour for attention in the context of the concern with human environment. They are problems which affect the greater mass of mankind.

5. It is evident that, in large measure, the kind of environmental problems that are of importance in developing countries are those that can be overcome by the process of development itself. In industrialised countries, it is appropriate to view development as cause of environmental problems. Badly planned and unregulated development can have a similar result in developing countries as well. But, for the greater part, developing countries must view the relationship between development and environment in a different perspective. In their context, development becomes essentially a cure for their major environmental problems. For these reasons, concern for environment must not and need not detract from the commitment of the world community - developing and more industrialized nations alike - to the overriding task of development of the developing regions of the world. Indeed it underscores the need not only for a maximum commitment to the goals and targets of the Second Development Decade, but also for their redefinition in order to attack that dire poverty which is the most important aspect of the problems which afflict the environment of the majority of mankind.

6. Whilst the concern with human environment in developing countries can only reinforce the commitment to development, it should serve, however, to provide new dimensions to the development concept itself. In the past, there has been a tendency to equate the development goal with the more narrowly conceived objective of economic growth as measured by the rise in gross national product. It is usually recognized today that high rates of economic growth, necessary and essential as they are, do not by themselves guarantee the easing of urgent social and human problems. Indeed in many countries high growth rates have been accompanied by increasing unemployment, rising disparities in incomes both between groups and between regions, and the deterioration of social and cultural conditions. A new emphasis is thus being placed on the attainment of social and cultural goals as part of the development process. The recognition of environmental issues in developing countries is an aspect of this widening of the development concept. It is part of a more integrated of unified approach to the development objective.

7. The incorporation of environmental issues and goals in the sense discussed here in the concept of development, raises - as does the incorporation of other social goals - important issues for planning and policy making. To the extent that these objectives support or reinforce economic growth - and it can be shown that some of them do - their place in the pattern of priorities would be more readily established. But where conflicts are involved, particularly in the short or medium run, more difficult choices would have to be made regarding the "trade off" between these and the narrower growth objectives. These choices can only be made by the countries themselves in the light of their own situations and development strategies and cannot be determined by any rules established a priori. Subsequent sections of this report attempt to identify and elaborate upon the specific environmental problems faced by developing countries and the ways in which these could be categorized as aids to planning. But the importance of distinguishing between measures or programmes that are conducive to growth or at any rate are not in conflict with it, and those that may involve some sacrifice in growth objectives is clear enough. It is similarly important to distinguish between measures or programmes whose claims on financial resources are likely to be relatively modest from those which are likely to prove more costly. The employment creating potential of environmental programmes is yet another aspect that is of relevance to the planning process.

8. Whilst the environmental problems of developing countries are in large measure those that have arisen from the lack of development, it is also true that problems arising out of the process of development are also in evidence in these countries to an extent that depends on their relative levels of development. Indeed as the process of development gets under way the latter type of problem is likely to assume increasing importance. The processes of agricultural growth and transformation, for example, will involve the construction of reservoirs and irrigation systems, the clearing of forests, the use of fertilizers and pesticides and the establishment of new communities. These processes will certainly have environmental implications. Similarly, industrialization will result in the release of pollutants and react on the environment in a number of ways. Again, the growth of the entire economic infrastructure of transport and communications will have consequences for the ecological system. Urbanization is already a pressing problem for many developing countries and some of their cities are experiencing problems common to those of the industrialized countries. In addition, with the urgent need for the rural areas to sustain a growing population, the problems of rural environment assume a new significance.

9. The problems are already severe enough in developing countries. But in the absence of resolute action, they will tend to attain formidable dimensions in the decades ahead. The very growth of population, when not accompanied by adequate economic development, brings out the prospect of rising unemployment, further impoverishing the countryside and swelling the drift to the towns and creating human problems of the deepest intensity. They can only aggravate the serious social and political tensions that even now prevail in these societies. There can indeed be little doubt about the urgent need for corrective action.

10. These issues are elaborated upon in succeeding chapters of this report. To the extent that some of the advanced environmental consequences of the process of development could be avoided by better planning and regulation, the developing countries have an opportunity to profit from the experience of the industrialized countries. The importance of establishing adequate safeguards and standards in project planning and preparation is thus underlined. These standards must necessarily be those that are appropriate to the specific conditions of these countries and be capable of being observed within the resources available to them. All this reflects the vital importance of data and of research. It also raises the question of the instruments by which environmental policies could be implemented, particularly in situations where decisions are undertaken by private investors, whether domestic or foreign, in the context of market forces.

11. Environmental issues may come to exercise a growing influence on international economic relations. They are not only a formidable competitor for developed countries' resources (which in some instances might have been channelled towards development assistance), but they are also a factor which, to an ever increasing degree, could influence the pattern of work trade, the international distribution of industry, the competitive position of different groups of countries, their comparative costs of production, etc. Environmental actions by industrialized countries may have a profound and many-fold impact on the growth and external economic relations of developing countries.

12. Some environmental actions by industrialized countries (restrictions on the importation and use of certain commodities, imposition of environmental regulations, standards and other non-tariff barriers on imports as well as increased production costs reflected in higher export prices) are likely to have a negative effect on developing countries' export possibilities and their terms of trade. Recycling of raw materials may also tend to diminish the volume of primary commodities consumed and imported into industrialized countries.

13. In some fields, environment issues open up new possibilities for developing countries. The structural changes in production and trade, as well as the geographical relocation of productive enterprises which might be necessitated by environmental consideration, should provide new opportunities for meeting some of the developmental needs of the developing nations. This relates first of all to the relationship between natural and synthetic products and the reopening of certain markets to exports of natural products. In some cases, developing countries might have a possibility of increasing the inflow of foreign capital and of creating new industries. If such opportunities are to be fully realized, they will require new and concerted measures on the part of industrialized and developing countries in the fields of international trade and investment, as well as in the control of private foreign enterprises.

14. The desire to retrieve some of the past damage to the environment and to minimize the environmental cost of future development will, in most cases, represent a new claim on productive resources and an additional element in the cost of production. Some of this burden may be reduced in the future as science and technology itself responds to the needs of environmental management. Still one of the major questions which would arise from the increased concern with the preservation of the environment is how the higher cost of future development would be shared as between industrialized and developing nations. There are misgivings in the developing countries that, given their peripheral role in the international economy, arising not only from their present low economic capacity and bargaining power but also from a declining relative share in world trade and the increasing gap in per capita income, they might not be able to take full advantage of the fresh opportunities that may arise from environmental control, while at the same time they might have to bear part of the extra burden which such control would entail. The increased cost burden arising from greater attention to environmental problems should be accompanied by a greater willingness to provide additional assistance and induce a greater effort to reduce the inefficient allocation of productive resources arising from indiscriminate protection of agriculture and industry in both industrialized and developing countries. It certainly should not provide fresh argument for even greater protection.

15. The focusing of attention on environmental issues has therefore implications that go beyond national policies in developing countries. The international aspects of the present environmental concern are discussed in a subsequent chapter. But we would like to stress here that the extent to which developing countries pursue a style of development that is more responsive to social and environmental goals must be determined by the resources available to them. Clearly there is scope for a better allocation of the presently available resources, but the results that could be obtained within their present resource constraints must necessarily be limited. If the concern for human environment reinforces the commitment to development, it must also reinforce the commitment to international aid. It should provide a stimulus for augmenting the flow of resources from the industrialized to the developing countries. Unless appropriate economic action is taken, there are a number of ways in which the developing countries could suffer rather than profit from the new emphasis on environment. The latter could have implications for aid, trade and the transfer of technology. The developing countries are vitally concerned that these implications should be positive and beneficial rather than negative and harmful.

## B. Environmental issues in the development process

16. The preceding chapter has indicated that the environmental problems of developing countries fall broadly into two categories - the problems arising out of poverty or the inadequacy of development itself, and the problems that arise out of the very process of development. The problems in the first category are reflected in the poor social and economic conditions that prevail in both the rural and urban areas. For most developing countries these are, by far, the problems of greatest importance. But as the process of development gets under way the problems in the second category also begin to emerge and to gain in significance.

17. The environmental policies of developing countries must naturally be concerned with both categories of problems. But, as the preceding chapter has indicated, the remedial approaches to the first set of problems are closely interwoven with policies for overall development. These policies should, of course, embrace wider dimensions than the growth of gross national product alone, and must include some of the major environmental problems that arise in the context of urban and rural poverty. As already mentioned, problems of poor water supplies, inadequate sewerage, sickness, nutritional deficiency, and bad housing need to be dealt with in the process of planning and policy making. Goals and objectives in these fields should be incorporated into development plans as much as targets for the growth of output.

18. The present Report will not attempt to elaborate upon the environmental issues of the kind referred to above or upon the manner in which they should be dealt with in the planning process. They are so much a part of social and economic conditions in developing countries that their treatment is but an aspect of the whole approach to social and economic development. Each country needs to identify the complementarities and conflicts that characterize the relationship between social and economic goals in the circumstances specific to itself, and to determine its own priorities concerning the allocation of resources. The present Report seeks to do no more than draw pointed attention to the compelling urgency of the environmental problems that arise out of poverty, to the need for a new awareness of the importance of remedial measures, and above all, to the need for reinforcing the commitment, both nationally and internationally, to the development objective itself. It is to be hoped that the emphasis that is now being given to a more unified approach to development will result in a better recognition and treatment of the environmental problems that arise out of mass poverty.

19. The rest of the present chapter and, to a large extent, the succeeding chapter as well is mainly devoted to the second category of environmental problems that was mentioned earlier - problems that arise out of the process of development itself. These problems though possibly of lesser importance in the early stages of development, are clearly likely to gain in significance as the process of development gathers momentum. As mentioned before, the transformation of agriculture, the development of industry, the creation of networks of transportation and communication, and the growth of towns, are all integral parts of the development process. They must, therefore, form part of the major goals of development policy and planning. But it needs to be recognized that the process of development and change in each of these sectors can be accompanied by adverse side effects which could in many cases be avoided, or at least mitigated, by sound planning and policy. The experience of the industrialized countries has shown that these side effects could, if ignored, attain formidable dimensions and cause damage and disruption on a wide scale. The developing countries have an opportunity to avoid some of the mistakes or distortions that have characterized the development process in the past. By paying attention to these dangers they can, perhaps, attain a more satisfactory pattern of development than that achieved by the industrialized countries.

20. The present chapter attempts, in a broad way, to identify some of the negative side effects that can arise out of the process of development in several sectors of the economy. The succeeding chapter discusses the ways in which these problems might be dealt with through better policies and planning methods. The main issue is how the benefits of development in each sector could be obtained with minimum adverse side effects. In presenting a selected catalogue of environmental consequences which can be, and have been, experienced in various sectors of the economy, our intention is not to describe a long list of adverse repercussions so as to imply inaction, since every action may affect environment in some manner: our intention is merely to bring together some of the available knowledge on this subject so that the developing countries can draw their own conclusions in the context of their development policies. We would also like to point out that the existing knowledge on this subject is fairly thin and sketchy and a lot more research work is needed to identify the nature and dimensions of environmental problems in various sectors of the economy.

21. The discussion that follows attempts to identify and describe some of the environmental side effects that have been known to accompany, in varying degrees, the process of development in agriculture, industry, transport and human settlement. These side effects take several forms and may be grouped into a number of categories. these are:

(a) resource deterioration: the deterioration, for example, of mineral, soil or forest resources;

(b) biological pollution: the pollution represented by agents of human disease, and by animal and plant pests;

(c) chemical pollution: arising out of air pollutants, industrial effluents, pesticides, metal, and detergent components and similar agents;

(d) physical disruption: as reflected, for example, by thermal pollution, silting and noise; and

(e) social disruption: of which congestion and loss of a sense of community are examples.

These side effects manifest themselves in varying degrees depending on the sectors concerned, the particular geographical regions involved, and the stages of development attained by different countries. The first two categories are commonly experienced by most developing countries as are also silting and perhaps social disruption, whilst urban air pollution is becoming a problem of increasing importance in the larger cities of certain developing countries.

22. Although these side effects are likely to manifest themselves in the process of development, they need to be assessed within a framework which helps to establish their relative importance. A basic consideration would be the way in which a development activity relates to the carrying capacity of a country's natural, and even social, system. Such issues as the speed at which environmental degeneration is taking place, the degree of its severity, the area that it covers, whether the environmental impact is reversible or irreversible, and at what cost and over what period of time are all of relevance in this connexion. The scale and pattern of a country's production and consumption structure are also of relevance in assessing the impact of environmental side effects. The use and disposal of materials and their environmental implications are, for example, influenced by the level of technology since this is relevant to the nature of inputs and outputs in the production process.

Similarly, consumption patterns are of importance. In societies where the levels of non-discretionary expenditures, i.e. expenditures on basic necessities, are high the process of consumption exerts adverse environmental effects of a lower order of magnitude. On the other hand, higher levels of discretionary consumption, particularly of more sophisticated manufacturing goods, generally produce a greater environmental impact. The social structure of a society, and its pattern of income and wealth distribution, are thus factors which are also of relevance.

23. Within a framework appropriate to its situation, a country may ascertain the nature of its environmental problems, and examine alternative forms of action in dealing with environmental policies. Environmental side effects which are encountered in the development of various sectors should receive selective treatment. They should first be evaluated in terms of the development priorities which guide the planning considerations of any country. Those side effects which directly frustrate the development objective should be given the most immediate attention for remedial action. Those of peripheral concern will inevitably receive less emphasis.

(i) Agriculture

24. The process of agricultural development often involves the transformation of low productivity systems of agriculture into systems where productivity is relatively high. In the course of this transformation, cultivation practices on existing lands are improved, the infra-structure of facilities and services for agricultural production is expanded, and new lands brought under cultivation through extensive systems of irrigation and river basin development. These changes are crucial to the development process itself. But they may also generate environmental side effects of varying degrees of importance. Some of the more common of these side effects are described here.

Traditional Agriculture

25. Environmental side effects may manifest themselves even within the framework of traditional systems of agriculture under the pressure of rapid population growth. These systems have often persisted for centuries, sometimes successfully cultivating the same lands without irreversible damage. But a new situation may be created by the rapid growth of population that is now taking place. This may impose pressures that were perhaps not experienced before and which could give rise to environmental problems.

26. Traditional agriculture in many tropical regions is characterized, particularly under stress of expansion, by a range of environmental hazards. These include leaching - notably the rapid leaching of nutrients and degradation of planted farmland following the removal of a forest; rapid soil depletion resulting from permanent cultivation which the relative infertility of the soil cannot support without the addition of nutrients; soil erosion through variable and heavy rainfalls and prolonged droughts or flash floods; and indiscriminate loss of forest resources through slash and burn techniques. Although much of this kind of environmental deterioration can be corrected if unlimited funds are available, some are so costly to correct as to be effectively irreversible. The fragility of tropical eco-systems may cause environmental deterioration to proceed rapidly and their recovery to be slow. In one instance, the establishment of an agricultural colony failed when deforestation resulted in the hardening of lateritic fields within five years. Restoration on the other hand will take decades. In another case, previously ungrazed savanna was destroyed by over-grazing in two to three years, and will probably be lost to production for a very long period. There are opportunities for preventing some of these environmental hazards through proper planning and anticipatory action. For instance under-employed labour that frequently abounds in rural areas may be mobilized in terracing mountain-sides and in reforestation programmes. Many of Africa's current marginal lands, for example, have all the necessary elements for successful reclamation through new management techniques.

Modern Agriculture

27. The environmental hazards in the case of modern agriculture rise mainly from the chemical control of weeds and pests and from irrigation works. Fertilizers, on the other hand, would not appear to pose a threat at the present even at prospective level of their use in the developing countries. The side effects of insecticides and pesticides need to be watched fairly carefully. Their toxicity to fish and birds, as well as their persistence and mobility, make them a hazard beyond their target area. Irrigation projects, unless matched by drainage facilities, can result in salinization and water-logging. In one country modern canal irrigation serviced forty million acres in 1949, of which five million acres suffered from salinization and water-logging by 1959. However, much of this land has since been reclaimed through appropriate management. Even the welcome emergence of the high yielding varieties of wheat, rice, maize and other cereals can sometimes give rise to certain negative side effects, both

because these varieties require larger quantities of chemicals such as pesticides and also since they replace hardy native species which, by natural selection, are often better suited to the adversities of local conditions and are valuable for inter-breeding. Again, constant tillage which is facilitated by mechanization can also damage the soil structure. Let us reiterate that modern agriculture would be impossible without the use of chemical fertilizers and pesticides, high yielding varieties of seeds and irrigation works, and a degree of mechanization, but it is important that their side effects should also be taken into account in planning the use of these inputs to expand agricultural production.

(ii) River basin development

28. River basin development projects are instruments of major importance for economic and social development, and are often an essential part of the development programmes. However, many of the environmental problems which are commonly discussed have arisen in connexion with the construction of these projects. This underlines the need for careful study and analysis in the design of large dams or dam sites, so that their negative side effects can be minimized through proper planning. Some of the environmental problems which are generally associated with the river basin development projects include the spawning of water born diseases, the filling of reservoirs with sedimentation, the drying-up of down-stream fisheries, the spread of salinization and water-logging in associated irrigation projects, the inundation of valuable agricultural and forestry land, the displacement of population and the loss of mineral resources, wild life areas or valuable historical sites. The emergence of most of these adverse effects is generally gradual. Some of them can be readily corrected but others are practically irreversible because the capital investment is very large and fixed. Some of the consequences can be on a very large scale and may frustrate the very purpose of the development project or plan. However, many of them can be anticipated by preliminary analysis. For these reasons, environmental aspects of such projects clearly merit high priority for analysis but it must be borne in mind that many of the associated environmental costs may have to be assumed in the pursuit of benefits offered by the project, or that remedial action could be taken to minimize these costs. It is often wrongly assumed that in the past all adverse side effects have come as surprises.

(iii) Industry

29. Pollution emanating from industrial development represents more of a potential than an actual threat at this time in many developing countries. However, there are a number of isolated instances of industrial pollution even in these countries. The developing countries have an advantage in so far as they can learn from the experience of the industrialized nations. By taking sensible decisions on the location of industries and their waste disposal, and by instituting social controls under which the private sector must function, they can avoid some of the worst environmental problems that have arisen in connexion with industrial pollution. Developing countries should give careful consideration to the question of location of industries and formulate concrete guidelines in the context of their own national situation, which would prevent the rise of major environmental problems. It would also be useful to identify cases where labour intensive technologies may produce less environmental disruption. This seems to us a high priority area for research.

(iv) Transport

30. A basic choice in the field of transport is between systems that provide mass transportation and the owner-operated vehicle. In the United States, and increasingly in Western Europe and Japan, the choice of the motor vehicle as the primary means of personal transportation is now resulting in critical environmental consequences: air pollution with damage to people, vegetation and landscape, increased accidents; pressure on urban space, and distorted configuration of human settlements. Here there is a clear area of choice. In the transport policies adopted by the developing countries some of these environmental problems can be avoided by providing means of mass transportation and by thereby reducing the need for owner-operated vehicles. This is, in any case, dictated by their own level of development and the need to reduce visible disparities among various income groups. Mass transit facilities represent the obvious alternative in urban areas to the kind of environmental problems that have arisen already as a result of emphasis on owner-operated motor vehicles in more industrialized societies.

### (v) Human settlements

#### Rural areas

31. The development process will have its inevitable impact on human settlements. The predominant part of the population in most developing countries still live in the rural areas. Often, these communities suffer from an inadequacy of services of one kind or another. Problems of health, nutrition, potable water supplies, and drainage are often severely felt in rural areas no less than in the towns. An inadequate infra-structure of agricultural and credit services is also a familiar feature of the rural scene, contributing to the persistence of low levels of production and hence of incomes. The stress of rapid population growth can, in certain situations, aggravate these problems and impose further strains on rural resources.

32. In such situations, there is often a drift of population to the towns which causes a further worsening of urban conditions. A pre-occupation with growing urban problems could, in turn, result in a further neglect of rural areas. Modern social, cultural, and economic activities capable of attracting educated youth may not exist in the rural areas and this could itself be a contributory factor to growing urban concentration and unemployment. Moreover, the process of rural-urban interaction can result in the disruption of traditional systems of social security such as that of extended families without the provision of suitable substitutes.

33. It is important that the planning process take account of these problems. With the rapid growth of population, developing countries are likely to face an increasingly urgent problem of employment creation. It is, however, unlikely that the expansion of economic activities in the urban areas alone through industrialization and related developments will suffice to provide employment opportunities for the full increase in the work force. A substantial part of the increment to population and the work force will need to remain in the countryside, and it is therefore vital not only that employment opportunities be created in rural areas, but that the whole structure of social and economic services in these areas be developed. This places a new emphasis on the rural environment and on planning and policy-making in this field. It would indeed be unfortunate if the new environmental concern over the effects of development on urban areas should result in an excessive concentration of resources on urban expenditures at the cost of environmental improvements in the rural sector.

Urban areas

34. As mentioned before, in the urban areas of the developing world, environmental quality is virtually synomymous with social welfare. Urbanization within a country can, of course, be accompanied by increased economic and social welfare, and urban concentration of dynamic enterprises can serve a valuable function as "development poles", generating growth throughout wider regions. However, the carrying capacity of any city submitted to rapid population growth is eventually over-extended, and the economies of size are displaced by the dis-economies of inadequate infra-structure. Disease, water supply shortages, lack of sewage treatment, congestion and deteriorating housing are all manifestations of environmental stress. The more developed urban areas are now confronted with chemical contamination of air and water and the hazards of social disorganization.

35. The major cities of the developing world experienced a fourfold increase in their populaces between 1920 and 1960. Today, in many developing countries, the influx of population is straining the existing capacity of cities. Their failure is symptomatic of imbalance in the development process, which could produce total breakdown in some instances in the coming decade. Each city has its own carrying capacity, which changes over time. This depends on the level and combination of population, economic and human resources, and infra-structure, which are in turn in constant evolution. But once that carrying capacity is exceeded, degradation proceeds very quickly. There is however, a high possibility of reversibility in this trend, which is not the case with natural systems. Government actions can reverse the city's deterioration, if sufficient resources can be mobilized.

36. The urban renewal projects in the industrialized countries are one line of attack. Often, however, such projects merely displace the slum population to new slums while more well-to-do people move into the renewed areas. Another line of attack is urban dispersal contingent upon planned allocation of new growth poles in conjunction with newly established industries and new urban settlements. Such planning is already underway in many developing countries. Less capital-intensive renewal schemes, especially ones drawing upon abundant labour, should be accorded a very high priority. Solid waste collection could also be resolved through mobilizing popular participation.

In implementing municipal sewerage systems, methods emphasizing the use of labour could be selected. Rather than relying on large inputs of technology or capital, multiple aerated lagoons which are stocked with fish, or spray irrigation to enhance soil conditioning, could be used.

37. It is widely recognized that deviant social behaviour emerges from a loss of community and social organization. Many developing societies display a high degree of social organization and a considerable sense of community, even in urban settings, as a result of the transplantation of traditional social structures in the process of rural-urban interaction. Where traditional social systems - with broad citizen participation - are conducive to integration as well as change, urban planning should make room for such traditional patterns.

## C. Some considerations for environmental policy formulation

38. We discussed in the last chapter some of the major environmental issues which may arise in the process of development. We turn now to a number of considerations which are relevant in formulating environmental policies in the developing countries. In describing these, we wish to make it quite clear that no general guidelines or specific formulas can be prescribed at this uncertain stage of our knowledge regarding the interaction of environmental and developmental policies. Each country must find its own solutions in the light of its own problems and within the framework of its own political, social and cultural values. The formulation of environmental goals, as indeed the formulation of economic and social policies in general, falls entirely and exclusively within the sovereign competence of the developing countries.

39. It is important that environmental policies are integrated with development planning and regarded as a part of the overall framework of economic and social planning. As we have stressed so often before, environmental concern is only another dimension of the problem of development in the developing countries and cannot be viewed separately from their development effort. The objective should be to regard environmental improvement as one of the multiple goals in a development plan. The developing countries have certain inherent advantages in integrating environmental and developmental policies. Most of them are already committed to planning so that imposition or acceptance of social controls is nothing new for them. They are also making a fresh start in many fields and can anticipate the environmental effects and provide for them in their current planning. The overriding constraint in the developing countries is, of course, the limitation of resources which poses fairly sharp choices between various objectives of planning. Since environmental improvement can be regarded only as one of the multiple objectives of planning, its priority in relation to other objectives should be determined by each society in the light of its own urgent economic and social problems and its own stage of development. Basically, this is a question of alternative uses of resources within the framework of comprehensive economic and social planning.

40. As we have pointed out before, the integration of environmental concern with development planning would require a broader definition of development goals than a mere increase in gross national product. The redefinition of development objectives must include greater stress on income distribution and employment, more attention to social services and welfare-oriented public goods, and greater provision for political

participation. There should also be a quantification of social goals in development plans so that actual progress can be measured against these goals. Besides quantitative targets in the fields of income growth and employment, similar targets should also be spelt out for income distribution, public health, nutritional standards, housing and other welfare-oriented public goods. In other words, the quality of life in a poor society should be defined in terms of a selective attack on the problems of mass poverty, and development plans should attempt to quantify the improvement that is being sought in eliminating the worst forms of malnutrition, squalor, disease and ignorance.

41. One of the ways to quantify social goals in development plans would be to establish the concept of minimum environmental standards. Each developing country can define for itself the minimum environmental standards that it is seeking in various fields and sectors such as public health, nutrition, water supply, etc. The formulation of these environmental standards can facilitate redirection of the efforts and energies of these societies towards certain concrete goals. Environmental indicators can then be devised to measure the progress of the society towards the norms it has established for itself. It should be stressed that environmental standards cannot be fixed for all time to come and must necessarily change over time as development proceeds. Again, it is quite possible that the resources of many of these societies may not be sufficient to achieve even the very minimum environmental standards in the short-run. However, the advantage of establishing these standards is that they can serve as a focus for national effort. The concept of minimum - or threshold - environmental standards would also help in disaggregating the target of GNP growth. Many developing countries are increasingly turning from a pre-occupation with "how much to produce and how fast" to "what is produced and how it is distributed". The formulation of quantitative social goals and minimum environmental standards merely gives a concrete expression to this growing concern.

42. The integration of environmental concern in development planning would require national action by developing countries on a fairly broad front. Some of the major policy areas will include location of industries, land use policy, urban-rural interaction and community development, and sectoral policies as described in the last chapter. Greater attention is also needed for physical planning of facilities so that individual development projects and programmes get integrated into the overall physical environment. There is some possibility that surplus labour in the developing countries

could be mobilized in the cause of environmental improvement, especially through projects of community development in the rural areas, since such projects may be found particularly attractive by the community and since they may require a larger labour input. These possibilities should be carefully explored through further research and study, especially as many developing countries are currently faced with the prospect of growing unemployment and under-employment and they have not been very successful so far in mobilizing their surplus labour to promote economic development.

43. From the macro level of redefinition of development goals, establishment of minimum environmental standards and formulation of environmental policies on an aggregative and sectoral basis, the developing countries need also turn to the micro level of devising appropriate techniques for including the environmental factor in the appraisal of development projects. It is necessary to find techniques for quantifying the impact of development projects on environment, both favourable and unfavourable, so that the society can choose these projects with a fuller knowledge of their social costs and benefits. All to often the social costs of various projects have been ignored in the initial appraisal, especially when development proceeded under a régime of free enterprise, so that the society's awareness of many of the environmental disruptions resulting from these projects came at too late a stage when the construction had already been completed. It is important that the social costs should be ascertained before undertaking development projects, so that the society can carefully choose whether these costs are still worthwhile in view of the other economic and social benefits of the project, whether some of these costs could and should be minimized in the design of the project, and whether some of the costs could and should be postponed through adoption of alternative technology.

44. The basic idea of social cost calculus is to make individual enterprises and units responsible to society at large. The society suffers when the individual unit does not assume all the costs which it generates. For an individual enterprise, environment is a free good which can be used and contaminated at will in the pursuit of high and quick profits or planned production quotas. For the society as a whole, environment is a part of its real wealth and cannot be treated as a free resource. This is why the traditional cost benefit analysis is inadequate unless it is broadened to reflect social costs and benefits. While an individual can afford to ignore these costs, the society as a whole cannot, and it has every right to insist that these costs be carefully calculated and deliberate decisions made as to who pays these costs and how much.

45. Some of the factors which may have to be considered in making allocation decisions are the following:

- the quantity and quality of known and required natural resources;
- the possible effects and probable date of their exhaustion;
- the availability or possible development of alternative technologies, including their relative costs;
- the suitability of alternative sites;
- the existing level of air and water pollution;
- the opportunities for waste disposal and for the re-cycling of raw materials;
- the environmental impact of the project, speed of degeneration, degree of severity, possibilities of reversibility and costs of various alternatives.

This is not a comprehensive list of the questions to be raised in the case of each development project but only illustrative of some of the concerns which should be formulated into specific questions whenever a development project is being appraised.

46. There is a considerable debate at present how specific guidelines should be formulated for project appraisal, taking into account environmental considerations in each sector and field. We have learnt that some work on guidelines is already underway in certain international financial institutions. While we recognize the need for specific guidelines for project appraisal, we must enter a note of caution here. In the present state of our knowledge, there is need for extreme care in devising specific guidelines so that they do not become bottlenecks in the implementation of development projects, or raise such issues of detail as are irrelevant in the current state of development in many of the developing countries. In any case, it is for the developing countries to formulate such guidelines in the light of their own experience and requirements. We suggest, therefore, that the developing countries should take an initiative in this regard and also discuss this issue at the level of the regional economic commissions, regional banks and other relevant international agencies. No rigid guidelines should be laid down by multilateral or bilateral donors at this stage unless there has been an opportunity for adequate consultations with the developing countries through various appropriate forums.

47. In order that social costs and benefits be properly calculated and reflected in the allocation of scarce resources, developing countries will have to consider the framework of social controls that they need to establish over economic decision making, particularly in the private sector. There is a wide variety of social controls which

can be considered in this context. There are indirect controls relying on the imposition of disincentives, such as taxes, effluent charges, etc. and on giving incentives through fiscal subsidies for environmental improvement. There are direct controls which range from outright prohibition, statutory regulation or the curtailment of production of toxic materials to administrative measures taken to control location of industrial production or human settlements. No general guidelines can be laid down as to the effectiveness of direct or indirect controls in various developing countries, since this will depend on a wide variety of factors, including their political systems, their social and cultural values and the economic strategy being pursued by them. Each society must find its own balance between the range of direct and indirect controls available in this field. Since a large proportion of total investment in developing countries is generally under public control, directly or indirectly, and since these countries are already using a number of administrative controls as well as fiscal incentives to regulate private activity, it should be easier for them to find a judicious balance between various forms of social controls for environmental improvement. We suggest that more study and research should be undertaken on the effectiveness of direct and indirect social controls over environment, so that a range of specific policies is available to the developing countries from which they can choose in accordance with their own requirements and preferences.

48. In order to formulate environmental policies, the developing countries require a lot more information and knowledge than they currently possess. We suggest therefore that one of the first priorities should be to broaden their knowledge and information in the environmental field. It would be useful if the developing countries undertake a survey of their present state of environment and the major hazards to which they are exposed. They should also undertake studies and research to define the kind of environmental problems that are likely to arise in the process of development over the course of the next two to three decades. It would also be helpful to compile all existing legislation regarding environmental control, including the regulations dealing with urban zoning, location of industries, protection of natural resources, and so on. This accumulation of information and knowledge should enable the developing countries to get a clear perspective of their environmental problems and the corrective action that they may require at different stages of development. Since public participation in any such efforts is vital, efforts should also be made to build the environmental concern into education curricula, and to disseminate it to the general public through media of

mass information. We would like to stress once again the need for a good deal of careful research and study in this field, and the importance of avoiding hasty guidelines and action.

49. Once the developing countries have integrated the environmental concern in their framework of development planning, and undertaken studies of specific policy action required at the national level, concrete institutional arrangements would be needed to implement policies of environmental control. It is premature at this stage to spell out in great detail what institutional arrangements may be required under different conditions. Nor can we say anything definite at present about the kind of special legislation that may have to be devised. A number of institutional arrangements have been suggested for the consideration of the industrialized countries including establishment of separate ministries or departments dealing with environmental control; setting up of environmental standards and indicators and their monitoring by special institutions; proposals for establishing Environment, Technology and Location Assessment Boards and for Environmental Quality Management Services; specific legislation to establish norms for the maintenance of clean air and clean water; new liability legislation regulating compensations for environmental disruption; enunciation of common or collective property rights with regard to such free and hitherto unprotected resources as air, water, soil etc. Many of these institutional arrangements have greater relevance to the problems of the industrialised countries than to the developing societies though the latter can study the experience of the industrialised countries with the implementation of these proposals with some profit. As we have repeatedly stressed, the problems of environmental disruption are still a relatively small part of the development concern of the developing countries and it may be premature for many of them to divert their administrative energies to the establishment of new institutions or machinery: they can just as well try to integrate their environmental concern within the framework of existing machinery for planning and development. In any case, the developing countries will have to undertake their own experimentation and improvisations in devising their institutional arrangements for environmental control in the light of their own specific needs and requirements as they emerge in the course of development.

50. It has been our aim in this chapter to provide an overall framework within which the developing countries can consider their own specific national action for environmental control. As we said in the beginning, no general guidelines or specific

prescriptions are possible, or indeed desirable, at this stage. The basis of national action is so much rooted in the varied conditions in each country that all we could do was to draw attention to certain overall considerations rather than to prescribe any specific policies. We recommend that further work should be done by the developing countries themselves on the range of national action which would suit their individual requirements, and that this be discussed at the level of regional commissions meetings and at the Stockholm Conference.

## D. Implications for international economic relations

51. We have discussed in the earlier part of our Report the changing nature of environmental issues in the development process and environmental policies relevant to different stages of development. While we believe that continued development is the only answer to many of the environmental problems of the developing countries, we also believe that these countries cannot afford either to neglect the environmental problems or to treat environment as a free resource as the presently industrialized countries too often did in their initial stages of economic progress. The character of these problems, of course, is quite different in the developing countries and the priority to be given to them in resource allocations is a critical issue but what is important is that the long-term costs of environmental problems are fully understood and reflected in the current planning policies of the developing world.

52. Even if the developing countries were to regard the present environmental concern of the industrialized countries to be an irrelevant irritant, they can hardly remain indifferent to, or be unaffected by it. Inevitably, the environmental concern will cast its shadow on all international economic relations. One can perceive these international implications only a little dimly at this stage: much more thought and research work is needed before the outlines become any clearer. But it is important to anticipate the adverse implications for international economic relations on the one hand and the great opportunities which may open up on the other, and then to suggest policy measures and institutional arrangements which could reduce the former and maximize the latter. There is, in fact, no other choice if a confrontation between the industrialized and developing countries is to be avoided.

53. There are growing fears in the developing world that the current environmental concern in the industrialized countries will affect them adversely in the fields of trade, aid and transfer of technology. Some of these fears may be no more than the inherent fears of the weak in any confrontation with the stronger members of the international community. But it is important that they be articulated clearly, analysed objectively and provided for in any international arrangements which are made.

54. There is a fear that the insistence of the industrialized countries on rigorous environmental standards of products exchanged in international trade may well give rise to a "neo-protectionism". Many of the industrialized countries will be loath to see their production and employment suffer if their export prices rise as environmental standards

are enforced; they may try to argue that imports from the developing countries based on less rigorous environmental standards should either be taxed or banned. The import-competing sectors and organized lobbies are likely to join in this outcry. Agricultural products may be the first to suffer. Some industrial products, notably chemicals, may fare no better. And from specifics, the argument can quickly go on to a general level. Why be liberal in admitting the products of the developing countries if they are the outgrowth of a "sweated environment"? The humanitarian concern for environment can far too easily become a selfish argument for greater protectionism. The developing countries still confront the argument of "sweated labour": the argument of "sweated environment" will be equally fallacious but even harder to beat.

55. In analysing these fears regarding trade disruption, we have to make several distinctions. First, there may be some exports of the developing countries (e.g. lead, high sulphur fuel) which are increasingly displaced by the development of a non-pollutive technology. The recycling of raw materials may also reduce the demand for some primary exports from the developing countries. This is merely the outcome of technological advancement and all that we can suggest is that there should be an anticipatory study of such export threats, development of an early warning system and measures to enable the seriously affected countries to restructure their investment, production and exports. Second, as has already happened in the case of some products on sanitary grounds, there is the possibility of a rise in non-tariff barriers against those exports of the developing countries which carry some environmental hazards. Dairy products, fish, meat, fruits and vegetables are among the likely products where the industrialized countries may enforce very high environmental standards. Already the import of fruits and vegetables carrying traces of DDT has been banned in certain European countries. Insofar as the standards enforced in the industrialized countries are primarily meant to prevent health hazards and some international agreement is reached on maximum acceptable standards, it should not be interpreted as a discriminatory move against the exports of the developing countries. But in the meantime action should be taken to cushion the disruptive effects of such measures on the trade of the developing countries through a system of prior consultation and warnings by the industrialized countrie of environmental actions contemplated by them. In certain cases, the possibility of channelling additional aid toward adapting export industries in developing countries to the new requirements in industrialized countries or towards a diversification of their exports should also be studied. The real danger is if the environmental standards

enforced by the industrialized countries are unrealistic and unilateral and are abritrarily invoked by them to keep some of the exports of the developing countries out of their own markets. Finally, the major danger that both developing and industrialized countries have to guard against is that the argument for better environment may be turned into an argument for greater protection by vested interests. When the concern spreads from the quality of a product to the environment in which such a product was produced, the alarm bells should ring all over the world for it would be the beginning of the worst form of protectionism.

56. As a first step, it appears necessary to draw advance attention to the implications of environmental concerns for the continued growth of international trade. Appropriate procedures for prior notification, consultation and co-ordination will be needed to avoid adverse effects for world trade arising from national measures designed to promote pollution control. Conflicts of trade interests arising in this area should be resolved through existing and evolving arrangements and procedures. In this connexion, the existing GATT framework - under which most of the industrialized countries have assumed specific rights and obligations - should be further used to mitigate such problems so as to reduce the fears of the developing countries that a desire for a better environment may lead to an increase in protectionism.

57. It is important that the dimensions of this problem should be carefully defined and more concrete information accumulated so as to serve as the basis of international action. We therefore recommend that a number of specific studies be undertaken to analyse the implications of the current environmental concern for trade disruption. First, a comprehensive study should be made, possibly by UNCTAD, of the major threats that may arise to the exports of the developing countries, the character and severity of such threats, and the corrective action that may be possible. Second, the FAO should continue its present useful work on food standards considerations, including contamination, and seek to establish agreed environmental standards and guidelines for the export of foodstuffs. Third, the GATT should undertake to monitor the rise of non-tariff barriers on grounds of environmental concern and bring out pointedly any such trends in its Annual Reports.

58. There is also a fear in the developing countries that excessive preoccupation with environmental problems will lead to a diminution of aid resources from the industrialized countries. Since there is an increasing concern in the industrialized world

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about the deteriorating quality of life and more attention is likely to be given to their own problems of slums, pockets of poverty and poor public services, it is argued that this may divert resources from foreign assistance to domestic needs. In a more exaggerated form, the fear is that the concern for environment may become a priority unto itself in the developed countries, like space exploration in the 1960's and take away resources badly needed for other purposes. Since there has been a progressive weakening of the will in a part of the industrialized world for giving foreign assistance to the developing countries, anxiety on this score is not entirely unfounded.

59. Aid priorities and project appraisal may also, it is feared, be distorted by an excessive tendency by the industrialised countries to apply their own environmental standards unthinkingly to the developing countries. To the extent that aid priorities are influenced by, and are an extension of, the current concerns in the industrialized countries, it is inevitable that they will respond to the growing environmental concern. Aid donors may well believe that projects meant for environmental improvement should claim a fairly high priority in the developing countries while the latter may give these projects a lower priority in the context of their own competing needs. Again, development projects may be held up for their presumed impact on environment if extensive guidelines for project appraisal are industrialized by the donors, as seems to have happened in the case of some recent hydroelectric projects. These projects may also become more expansive if much higher environmental standards are insisted upon than are appropriate to the developing countries at their present stage of development. By their very nature, environmental diseconomies are very difficult to measure or quantify and there can be greatly different judgements on the time period over which they may occur and the priority that should be attached to their elimination or reduction in the current design of a project. There is a fear as such that there may be serious distortions in the allocation of aid funds to various projects and even greater delays in the processing of projects in view of the growing environmental concern in the industrialized countries and its unthinking extension to the context of the developing countries. It is imperative, therefore, that multilateral and bilateral donors do not rush into the preparation of detailed guidelines for project appraisal from an environmental viewpoint without adequate consultation with the developing countries and without providing adequate safeguards against arbitrary guidelines and undue project delays. We realize that the question of a shift of aid from a project

basis to a programme basis is already under debate and raises many issues beyond the purview of our discussion, but the danger which we point out above should add one further consideration in favour of such a shift. It seems to us desirable that environmental considerations be discussed between donor and recipients on their own merits and the danger must be avoided that discussion of environmental aspects of projects may delay and reduce the flow of aid.

60. Besides the flow and direction of aid, the kind of technology that is transferred from the industrialized to the developing world may be seriously affected. It is quite likely that future technological developments in the industrialized world will be influenced by their current preoccupation with non-pollutive technology. To the extent that these developments are shaped by the environmental problems faced by the advanced countries and do not take into account the conditions in the developing countries, technology which is transferred from the industrialized to the developing regions may become even more inappropriate than it often is at present. It is also obvious that some of this non-pollutive technology would be quite costly for the developing countries. No definite estimates are at present available as to how costly the non-pollutive technology may be (vague estimates ranging between five and twenty per cent are often mentioned). We propose that further research be undertaken in this area, preferably under the auspices of the United Nations Committee for Science and Technology. If such equipment is significantly more expensive than the present technology, its export to developing countries under tied credits will further reduce the real content of foreign assistance.

61. All these are legitimate fears. But they should not be exaggerated. In any case, the best strategy for the developing countries is to articulate them fully and to seek opportunities to turn the environmental concern in the industrialized countries to their own advantage or at least neutralize its adverse implications.

62. There is, first of all, a prospect that the global concern for environment may reawaken the concern for elimination of poverty all over the globe. An emerging understanding of the indivisibility of the earth's natural systems on the part of the rich nations could help strengthen the vision of a human family, and even encourage an increase in aid to poor nations' efforts to improve and protect their part of the global household. There is at least a chance that the legislatures in the industrialized world may be more, not less, forthcoming in their allocations for foreign assistance

as they face up to the problem of deteriorating quality of life at home in the midst of obvious affluence. This opportunity must be seized. For this, the environmental problem has to be placed in its proper perspective both in the industrialized and the developing countries. It should be treated as a problem of the most efficient synthesis of developmental and environmental concerns at different stages of social transitions. Furthermore, it must be emphasized in all international forums, including the Stockholm Conference, that it is for the industrialized countries to reassure the developing world that their growing environmental concern will not hurt the continued development of the developing world nor would it be used to reduce resource transfers or to distort aid priorities or to adopt more protectionist policies or to insist on unrealistic environmental standards in the appraisal of development projects.

63. The environmental concern can also be utilized for greater support for projects and programmes in the social sectors. Traditionally, the aid-giving agencies have tended to frown upon such projects and programmes for their presumed low rate of return, at least in the short run. But investment in human resources is now catching the imagination of the donors. Programmes in education, nutrition, public health, water supply and other social services are beginning to be regarded favourably. Here is another opportunity that can be grasped. The developing countries can use the growing concern for social services in the industrialized world to escape from the tyranny of financial rates of return in traditional project appraisal, to seek broader international support for their social programmes in conformity with their own national priorities, and to obtain a greater amount of local currency financing for these programmes and projects.

64. There may well be other opportunities. If there is a growing concern about the pollutive effects of synthetics industries, the present rate of substitution for natural resources of the developing countries may at least tend to slow down. If there is a concern about the depletion of natural resources, opportunities may open up for re-examination of prices negotiated under long-term commodity agreements and renegotiation of concessions for minerals and oil. If there is a technology based on recycling of raw materials, it could also help the developing countries by opening up opportunities for saving in resource use, use of waste materials and more efficient management of their own development. If there is a universal concern for global environmental problems, additional financial resources may become available from the

industrialized world to combat these problems at an earlier stage in the developing countries. Special attention could also be given to seeking out other possibilities of achieving complementarity between the Second Development Decade strategies and efforts in the field of human environment. The main strategy should be to seize these and other similar opportunities, to enlarge their scope and to build upon them the edifice of more beneficial international economic relations. Attitudes of isolationism and indifference will hardly help in a world drawn increasingly closer; the developing countries must articulate their own interests and insist on international arrangements to protect these interests in the changing pattern of trade, aid and technology.

65. In this context, there are two major issues that we considered at some length: the opportunity for relocating industries with pollutive implications in the developing countries and the possibility of setting up a Special Fund for financing the implications of the environmental concern for the developing world. Our deliberations on these two issues are set down below.

66. The enforcement of higher environmental standards in the industrialized countries is likely to raise the cost of production of several "pollutive" industries such as petroleum and chemical industries, metal extracting and processing industries, paper and pulp industries. Such a development opens up an opportunity for the developing countries to move into some of these industries if their natural resource endowments, including relatively less used environmental resources, create a comparative advantage in these fields. Such efforts should not, however, lead to a discarding of environmental standards adopted by the developing countries. Unfortunately, this whole subject bristles with controversies. There are those who argue vigorously that there should be no export of pollutive industries from the industrialized to the developing world. There are others who believe, just as strongly, that the opportunity for a better geographical distribution of industries must be seized immediately irrespective of any environmental costs. The elements of a sensible policy probably lie somewhere in the middle of these two extreme view points. Firstly, industries which may be regarded as pollutive in some advanced countries because of their more limited environmental carrying capacity may well not be pollutive, or much less so, in the context of the developing countries with much less environmental pollution at present. Secondly, environmental standards and costs are likely to be quite different from developed to the developing world so that the developing countries may still possess

comparative advantage in some of these industries despite the adoption of certain environmental controls in conformity with their own requirements. Thirdly, there is no reason why the developing countries should permit foreign investment, which comes to their countries into pollutive industries, to escape more stringent environmental standards back home if it results in a high rate of remittance of profits and even a lower net transfer of resources. In any arrangement that is made, it must be ensured that (a) foreign investment is on favourable terms and conditions, (b) it adds to the net transfer of resources, and (c) it conforms to the environmental standards that the recipient country wishes to impose in the light of its own stage of development and its own cultural and social objectives. So long as these safeguards are provided, there is no reason why the developing countries should not increasingly specialize in certain industrial fields, both for home market production and export purposes, which are going to become more costly for the industrialized world because of their growing concern with environmental standards.

67. We have also discussed the question of who pays for the higher costs arising out of the environmental concern and how the burden is to be shared between the industrialized and the developing world. Looking at the problem strictly from the point of view of the developing countries, it is quite clear that additional funds will be required to subsidize research for environmental problems for the developing countries, to compensate for major dislocations in the exports of the developing countries, to cover major increases in the cost of development projects owing to higher environmental standards and finance restructuring of investment, production or export patterns necessitated by the environmental concern of the industrialized countries. There was some discussion on how these additional funds should be provided. A proposal was made that a Special Fund should be set up specifically for this purpose. It was, however, felt that the consideration of a Special Fund was premature at this stage and the additional funds could as well be channelled through the existing international machinery so long as they could be clearly earmarked for the above-stated objectives, and clearly recognized as being additional. While the precise mechanism for the channelling of additional funds could not be discussed by us in any comprehensive manner, it was generally agreed that additional resource flows in one form or another will be needed.

68. Finally, there is a need for co-ordinating various international activities in the field of environment as well as for diffusing knowledge among developing countries of the nature and scope of these activities. Adequate institutional arrangements should be ensured for this purpose.

69. The subjects discussed in this chapter are closely related to the Strategy for the Second Development Decade as adopted by the United Nations. It is suggested that the considerations set out here should be taken into account during the review and appraisal of this strategy.

## Annex II

## Environmental problems in the developing countries: basic issues

Summary of the report prepared by the
Working Party convened by SCOPE in
co-operation with the secretariat of
the Conference [1]

(Canberra, Australia,
24 August - 3 September 1971)

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[1] The list of participants in the Working Party appears on next page

The participants in the Working Party were:

| | |
|---|---|
| Prof. F. di Castri, | Director, Institute of Ecology, Austral University of Chile, Chairman of the Working Party. |
| Prof. M.Al Kassas, | Department of Botany, University of Cairo. |
| Prof. W.B. Banage, | Minister of Animal Industry, Game and Fisheries, Kampala. |
| Prof. Carlos Casas-Campillo, | Instituto Politecnico Nacional, Mexico. |
| Dr. P. Choosakul, | Secretary-General, National Research Council, Bangkhen, Bangkok. |
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| Dr. A.R. Teixeira, | Director, Botanical Institute, Sao Paulo, Brazil. |

The following members of U.N. Advisory Committee on Science and Technology (ACAST) also attended:

| | |
|---|---|
| Dr. S. Peters, | Canada. |
| Prof. Sarwono Prawirohardjo, | Indonesia. |

# ENVIRONMENTAL PROBLEMS IN THE DEVELOPING COUNTRIES: BASIC ISSUES

## INTRODUCTION

1. This annex presents the general views of a Working Party of natural scientists from the developing countries of Asia, Africa and Latin America on the main environmental problems of these regions.

2. Development is the prime objective of the less industrialized nations. Developing countries are doing all they can to build up their industries and systems of transportation and are, as a result, experiencing pollution problems that are similar to, though less extensive than, those experienced in highly industrialized countries.

3. Although the process of development is intensifying the environmental problems in developing countries, the concern with environmental issues emanates from a wide range of hazards present in these countries. These hazards include:

- uncontrolled increase of urban population;
- increases in the number and variety of endemic and epidemic pathogens and pests;
- nutritional deficiencies;
- exhaustion of natural resources;
- continuation of traditional land-use practices which prevent the accommodation of higher population pressures;
- degradation of the environment stemming from widespread use of chemicals that are alien to natural processes.

4. Many of these hazards are also present in the more industrialized countries and, in some cases, steps to overcome them have been successful. However, the direct transfer to developing countries of knowledge and technologies generated in industrialized countries is seldom successful because of ecological, cultural and socio-economic differences. This is especially true in the domain of management of natural resources but is also true in the case of introduction of new industries. What is needed is new techniques that are ecologically oriented to local needs. To this end, national and regional knowledge generating centres should be created (or strengthened if they exist) and charged with the responsibility of finding ecologically sound solutions to environmental problems.

5. An ecological approach has not been widely adopted in developing countries. This is partly due to lack of knowledge about many fundamental aspects of the functioning of the ecosystems. In many instances, the knowledge is present but not effectively utilized because of poor communication between the knowledge generating centres and the decision makers. Responsibility for this failure is shared by the scientific communities and the administrators.

6. The meeting agreed that the following are areas of major concern to developing countries:

- the development and management of natural resources;
- the improvement of human settlements;
- the control of pollution and environmental hazards;
- education;
- institutional arrangements for the solution of environmental problems.

7. There are obvious differences in national and regional priorities for dealing with specific environmental problems, but the meeting was unanimous in emphasizing the common character of problems and approaches and the necessity for a common strategy and joint action to face the environmental challenge.

8. Though the need for a common strategy was emphasized, there was a consensus that scientists in developing countries should be inspired by their national heritage and historical values in their approach to the solution of these problems. It was agreed that the preservation of cultural and social diversities is the very essence of the stability and survival of mankind.

## A. Development and management of natural resources

9. Development of natural resources implies the interference of man in elements of his environment. The quantity and quality of the resources available to man will depend on his skill and resourcefulness in making use of them. Sound management of the environment can provide for sustained flow of resources and for maintenance of quality of the human habitat. No conflict need arise between these two equally important objectives if ecological factors are considered along with socio-economic factors when decisions are made regarding the use of natural resources - in short, an ecological approach to the management of natural resources. The adoption of such an approach rests on knowledge of the environmental implications of contemplated actions.

### (i) Ecological approach

10. The "carrying capacity of environment" varies according to the plant and animal species of the area, and also in relation to the socio-economic values of the society. At a low level of subsistence, environmental resources can provide for minimum needs of a large population, with no security against hazards such as years of drought. At a quality level, environmental resources are made to provide for needs of an optimum population with security against hazards.

11. Developing countries are faced with the responsibility of evolving and executing development plans at a rate that will meet the aspirations of their masses and bridge the economic disparity between the rich and the poor. To effectively achieve this goal, development should be planned as an integral and coherent enterprise incorporating environmental considerations. The concept of quality level of subsistence need not be synonymous with "high rate of consumption of materials". An ecological approach can maximize the positive output of development and minimize the negative effect of man's interference with the environment.

12. Lack of an ecological approach is obvious in many practices of exploitation of natural resources. The wide-spread but often unnecessary utilization of fire in land-use practices in extensive areas of Africa, Latin America and Asia; the over-exploitation of natural forests for short-term financial gains in many parts of the tropics; the over-grazing of grass-lands all over the world; and the over-fishing of coastal, estuarine and inland waters are some of the examples of exhaustion of environmental resources. These practices are sometimes badly conceived even from an economic point of view. In addition, the excessive use of agricultural chemicals has, in many instances, caused ecological problems.

13. The process of reversing an ecosystem disturbance (e.g. eutrophication of rivers or lakes or desertification) and restoring it to its natural state is prohibitively expensive and slow. What is more, the adverse effects of bad management practices may extend beyond the limits of national boundaries. For these reasons, if for no other, careful management of natural resources is a matter of urgent concern to developing countries.

14. To be effective, natural resources management should take the following into account:

- development plans and policies should include a diversity of projects and cater for alternate projects even at the planning stages. This is to safeguard against the hazards of monoculture and dependence on a single product or highly limited range of products;
- in the process of development, certain areas representing the principal natural ecosystems should be reserved for continual monitoring so that the functioning of natural systems can be compared with man-made replacements. The information provided by this comparison will help in evolving the proper management procedures for the establishment of stable and productive agricultural systems. A network of natural reserves will also have the added value of maintaining sources of biological diversity and of providing sites that can be used for educational or outdoor recreational purposes;
- social, cultural and historical factors should be considered as a part of the ecosystem in the formulation of development plans.

### (ii) Information and knowledge

15. Every country needs a body of knowledge about the local environment as a basis for planning in connexion with natural resources development.

- surveys and inventories are needed in most developing countries to fill basic gaps of information about soil, water, mineral, plant and animal resources. These programmes will, of course, be on a national level. In certain fields, however, regional co-operation could be advantageous, e.g. surveys of Flora of East Tropical Africa, Flora Neotropica, etc;
- surveys of natural resources should be associated with programmes of research for further identification of ecosystems and analysis of their functioning;

- not enough is known about the functioning of certain ecosystems, especially tropical forests and savannas. Multinational programmes of research will be needed to fill these gaps, aiming at exploring ecologically sound alternative plans for development.

16. Developing countries should take advantage of the projected global interdisciplinary schemes of systems analysis for principal biomes such as deserts, grasslands and forests. They should, in addition, consider inter-biome studies in planning development projects that involve a diversity of ecosystems within a natural area such as a river basin.

17. There should be a two-way flow of information between the research workers and the planners and decision makers so that all relevant knowledge will be utilized in the process of decision-making. Research is an expensive and time-consuming enterprise, and developing countries cannot afford to ignore locally available research information in all their development programmes.

## B. Improvement of human settlements

18. Many developing countries are finding it difficult to improve the standard of living of their citizens because their population is increasing more rapidly than their productive capacity. They therefore are attempting to hasten the development process and are exploiting their natural resources without taking into consideration the effect such exploitation is likely to have on the environment.

19. The growth of industry is proceeding in an unplanned fashion. Industrial developments are often concentrated in a few selected areas. People from less developed areas move to these urban centres in the hope of finding employment and better living conditions. Soon the facilities of these areas become overburdened and over-crowding, poor sanitation and adverse social conditions result.

20. To minimize the adverse effects of this rapid increase in urban population, developing countries should include four elements in their development planning.

- national policies on population planning;
- careful siting of new industries to avoid overconcentrations of population in a few centres;
- improvement of the facilities in rural areas surrounding an area in the process of industrialization, e.g.
  - opportunities for education
  - training in integrated agricultural practices;
- efforts to preserve a sense of community among groups that have moved from rural to urban areas.

21. Certain development projects, such as hydro-electric plants, have often entailed large-scale displacement and re-location of people. This has, in many instances, had serious repercussions on the health and social vigour of the re-located population, primarily because not enough was known about their inherent social attitudes and about the environmental conditions and resources of their new habitat. It is therefore suggested that comprehensive socio-ecological studies should be part of the feasibility studies of such large-scale projects and also of the attendant programme of re-settlement and rehabilitation.

22. In several parts of the developing world, aboriginal populations still exist in isolated regions. These populations are in danger of rapid extinction. This process, if left unchecked, will destroy a genetic heritage and will prevent us from understanding the characteristics and cultural values that have permitted the survival of these populations. Such knowledge may prove to be useful for the management of these regions.

## C. Control of pollution and environmental hazards

23. Awareness of pollution as an environmental hazard is becoming world-wide. Pollution problems are not peculiar to industrialized countries; developing countries face problems somewhat similar in nature. The difference lies in the relative seriousness of various types of pollution, the degree of priority attached to them, and the level of perception and awareness of the public.

24. The following are among the most important sources of pollution in developing countries:

(a) unsatisfactory methods for disposal and treatment of sewage and household and industrial wastes. These materials are often discharged without treatment into inland or coastal waters causing serious problems of pollution and consequent decrease of exploitable resources;

(b) land utilization practices that lead to extensive soil erosion, increase the concentration of dust in the air, cause the discharge of considerable amounts of silt into river systems, and cause floods. These practices include reckless deforestation, over-grazing, and uncontrolled use of fire. The adverse effects of these processes often extend beyond national boundaries;

(c) excessive utilization of chemical fertilizers, herbicides and pesticides. This is causing pollution through the leaching of these chemicals into the soil and water, accumulation of some chemicals in agricultural products, and methods of application, such as aerial spraying, which may produce direct harmful effects on humans and animals. Excessive utilization of chemical biocides is causing biological imbalances and, in many cases, has given rise to the appearance of new or resistant pests;

(d) use of chemical biocides in campaigns against diseases (DDT in anti-malarial campaigns is an outstanding example). The residues of these biocides are important sources of environmental pollution;

(e) industrial and motor vehicle emissions. Although this form of pollution is at present less intensive in developing countries, it is accentuated by lack of constraints in the form of public awareness and anti-pollution legislation;

(f) the discharge of oil and its by-products into oceans. These discharges result from international trade and transportation of oil, the development of off-shore oil fields and the coastal location of oil refineries. Apart from polluting oceanic waters and thereby affecting fisheries, these materials are often washed back to the shores, polluting beach areas. This adversely affects local and international tourism which provides substantial sources of income in many developing countries.

25. Developing countries are hampered in their attempts to combat these forms of pollution by the lack of an infrastructure. Before any degree of control can be achieved, legislation must be developed, enforcement machinery must be put in place, research aimed at discovering less harmful practices must be carried out, and public awareness of the need for control must be generated.

## D. Education

26. In many developing countries, not only are the opportunities for education available to the average citizen insufficient, but also the quality of education needs basic reform. These countries have been intent on providing a classical type of education and have given little thought to its social relevance.

27. Developing countries are constantly building up and improving their national patterns of education, training and research. Educators in these countries should now attempt to adapt educational programmes to the national conditions, with the aim of increasing students' knowledge of the world in which they live, helping them to improve the quality of life, and stimulating their thinking.

28. The major problem in most developing countries is the lack of understanding among the population of the role of man in modifying his environment, for better or worse. These countries also suffer from an acute shortage of middle-level technicians skilled in the management of natural resources. To overcome this, modifications should be made at all levels of education.

29. High priority should be given to the reform of primary and secondary school curricula to include basic ecological concepts. As far as possible, examples available locally or nationally should be used and increased emphasis should be placed on field work. The use of national nature reserves for field studies should be encouraged. In order to stimulate the interest of the younger generation, national regional and international competitions related to national and global environmental problems could be organized.

30. Due attention should be given to updating the knowledge of teachers, and to the preparation of teaching materials. Concise and cheaply produced monographs including textbooks should be made available.

31. At the university level, all students, including those in engineering, architecture, economics, social sciences and medicine should be trained to be aware of the effects of development on the environment and of the need for appropriate siting of industrial complexes, roads, dams, and new towns. Environmental scientists should, on the other hand, be made equally aware of the social implications of the application of environmental techniques.

32. Action should be taken to remove departmental barriers in the study of environmental problems so as to obtain an interdisciplinary approach with participation of representatives from different departments, and even from different institutions.

33. The training of research workers in the environmental sciences should be carried out nationally and/or regionally as far as possible. This is the best way to avoid frustration brought about by differences between home conditions and those of the places of training and to ensure that the training is relevant to national problems. To this end, local institutions should be strengthened by:

(a) creation of co-operative links between institutions in developing countries dealing with similar problems;

(b) exchange of scientific personnel and students among developing countries and between developing and industrialized countries;

(c) establishment of regional and inter-regional training courses;

(d) organization of seminars and advanced short courses, with the participation of scientists from industrialized countries;

(e) financial support and scientific assistance from national and international agencies.

34. Transnational centres should be established to provide training and research on local and regional problems, and to synthesize available knowledge into a co-ordinated whole. Every effort should be made to raise the standard of excellence in these institutions so that they become effective centres for training.

35. Continuing education on environmental subjects should also be provided for scientists and decision makers.

36. Scientists from developing countries should develop avenues for communication and exchange of experiences, perhaps by joint meetings and seminars and the publication of learned journals or news-letters of regional interest. Seminars attended by both scientists and decision makers should also be encouraged as a means of ensuring closer contact between the two groups and of stimulating awareness among decision makers of local environmental problems.

37. Finally, to improve public awareness of the importance of environmental control, short courses should be given to journalists and other mass media workers to ensure that newspapers, radio and television give effective coverage to events of environmental importance.

## E. Institutional arrangements

38. There is increasing recognition among the scientific community that an interdisciplinary approach is necessary for the solution of environmental problems. Institutional arrangements, at national regional or local levels, must therefore be made to permit such an approach.

39. Local environmental problems are best handled on a national basis, so that the results of research can be effectively incorporated into government policy. Thus, every country needs to set up organizations to study environmental problems, and to promote the activities already going on. National efforts may be concentrated in one central institute or carried out in several institutions co-ordinated by a national environmental council. National environmental organizations should concentrate on

- identifying environmental problems that need immediate solution and promoting research to solve them;
- co-ordinating the activities of the different institutions involved in research on environmental problems;
- promoting the training of research workers and scientific personnel at all levels;
- obtaining funds from national and international sources to support environmental research and training programmes;
- serving as a liaison body between the scientists and the decision makers, and opening channels of communication not only with the government of the country, but also with regional and global organizations.

40. The scope of some environmental problems extends beyond national borders and yet may not be of global significance. They may for example, concern a biome, a watershed, or an estuary in more than one country. Such problems should be handled through transnational institutional networks. A transnational network would bring together scientists and institutions interested in common or related problems from the different nations. Such regional networks would enable developing countries to pool their expertise and resources. Some of these networks could be target oriented; others might focus on a particular region, serving as centres of excellence in a particular field of environmental study for both training and research.

41. The exact organizational pattern of these networks may vary in different areas and for different problems. The functions of a transnational network would be essentially to supply the problem solving needs, training requirements and liaison functions of the participating countries.

42. It is increasingly evident that there are environmental problems of a global nature, such as pending climatic changes and ocean pollution, which can best be solved through international co-operation. Governmental and non-governmental international organizations are tackling some of these problems, but there is still a need for greater and more effective co-ordination, increased funding, and general acceleration of these scientific activities.

# Annex III

## Regional seminars on development and environment

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## REGIONAL SEMINARS ON DEVELOPMENT AND ENVIRONMENT

### A. Introduction

1. To encourage the effective participation of the less industrialized countries in the preparations for the Conference on the Human Environment and to examine particular environmental problems affecting the different regions of the developing world, the United Nations Regional Commissions and the United Nations Economic and Social Office in Beirut convened four seminars - in Bangkok, Addis Ababa, Mexico City and Beirut - during the months of August and September 1971 in co-operation with the secretariat of the Conference.

2. Representatives of seventy-two less industrialized countries attended these seminars. Their discussions were centred on the basic issues contained in the Founex Report[1/] and in other documents prepared by the regional economic commissions.

3. The major environmental problems of the less industrialized countries were identified during the discussions as common to all regions. It was evident to the participants that they were predominantly problems that reflect the common denominator of inadequate development. It was pointed out that some problems were more acute in certain regions and sub-regions of the developing world and would need to be dealt with at those levels.

4. Participants of the ECAFE regions expressed concern about the problems of human settlements in the developing countries, particularly in the context of the pressure of population growth. Problems related to the exploitation of natural resources including land degradation and soil erosion, received special attention at the ECA seminar. The Latin American seminar stressed the importance of including environmental considerations in the planning process for economic and social development. Countries of the Middle East region were concerned with the environmental implications of natural resources management, especially those affecting agricultural, water and mineral resources.

5. The seminars should be viewed as a first but very important step in the direction of regional co-operation in the environmental field, not only between countries sharing similar problems but also between intergovernmental agencies dealing with global and regional problems. It is clear that the United Nations regional commissions have an important role to play in the protection of the human environment.

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[1/] See annex I.

B. Development and environment - General principles

6. The following conclusions could be drawn from the results of the seminars.

- there was general endorsement of the spirit and recommendations of the Founex report which was considered to constitute a positive and balanced approach to the relationship between development and environment;
- it was agreed that the environmental problem was only one aspect of the general problem of development. The ultimate objective of both environmental control and economic development was the physical, mental and social well-being of man. Thus there was no conflict between development and environment so long as environmental policies did not hinder the development process;
- solutions to environmental problems in the less industrialised countries could only be found through a dynamic process of economic and social development. However, high rates of economic growth could often go hand in hand with neglect and even deterioration of environmental conditions. Accordingly, there was a consensus in all regions on the need for a multi-sectoral and inter-disciplinary approach through the integration of environmental considerations in planning machinery at the national and local levels. It was recommended that each country consider establishing adequate institutions for environmental planning, management, and control, to be integrated with the machinery for development planning;
- the relationship between development and environment varied with different levels of economic and social development. Each country had to formulate its environmental policies in the light of its special characteristics and values and through the exercise of its sovereign rights;
- while there was confidence that the progress of science and technology would contribute to the solution of environmental problems, it was recognized that the present level of knowledge of some aspects of the environment, particularly the ecology of tropical, subtropical and arid zones, was still inadequate;

- there was a fundamental difference between the environmental problems of the less industrialized countries and those of the industrialized countries. The less industrialized countries faced two distinct environmental problems:
    - those arising out of poverty and inadequacy of development
    - those generated by the very process of development.
- the less industrialized countries could profit from the experience of the industrialized countries. They could attain a better pattern of development by paying attention to environmental needs;
- more specifically, it was recognized that the concern for the environment could provide the less industrialized countries with new economic opportunities which might include: an improvement in the value of natural commodities in relation to synthetic products; the relocation of industries to developing regions; an increase in resources available for social development programmes aimed at improving the quality of life in less industrialized countries; and a better understanding of the nature of development problems and of the need for international co-operation to solve them;
- efforts to protect the environment in the industrialized countries should not lead to new forms of protectionism which could affect exports of the less industrialized countries. Nor should the environmental concerns of the industrialized countries lead to reduced flows of development assistance or to changes in aid criteria, transfers of technology, and industrial location policies which could adversely affect the less industrialized countries;
- while the less industrialized countries recognized the need to participate in efforts to solve certain global environmental problems, such as marine and air pollution, they did not consider themselves responsible for these problems;
- the importance of regional co-operation to deal with environmental problems was stressed in the seminars, with particular reference to co-operation in research and exchange of information and also in the formulation of environmental policies for natural areas covering the territory of more than one country (e.g. river basins);

- the seminars demonstrated that the less industrialized countries were fully prepared to contribute constructively to the success of the Stockholm Conference. While believing that existing international institutions should be used as far as possible to undertake new tasks in the field of the environment, these countries were prepared to support a strengthening of international co-operation in this field, including the provision of new financial resources for the protection of the global environment.

C. Environmental problems of the regions

7. Four major areas of environmental concern were identified and discussed and the following conclusions were reached.

(i) Human settlements:

- human settlements, particularly in the urban areas, had not been planned and designed for orderly future development taking account of particular regional conditions (climate, values);
- the pressure of rapid population growth and of accelerated migration to urban centres led to the further development of unplanned and uncontrolled urban settlements;
- the vital elements contributing to the human environment of urban areas, such as water, air, and the physical environment, had thus been affected. The deteriorated physical environment appeared in the form of slums and transitional settlements;
- socio-economic factors, such as lack of employment opportunities, inadequate resources for the provision of community facilities, social services, transport, etc., were at the root of the problem of urban settlements;
- rural settlements faced acute problems of poor housing and sanitation, malnutrition, lack or shortage of services and other facilities, and health hazards.

(ii) Natural resources

- a number of problems arose from the exploitation and mismanagement of natural resources;
- this necessitated making effective structural provision for the protection conservation and management of natural resources;

- the inadequacy of natural resources inventories was recognized;
- existing means and techniques for the management of natural resources were found to be insufficient;
- the importance of the ecosystem in managing natural resources and in development planning was stressed;
- the following more specific environmental problems of natural resources were discussed: soil degradation; deforestation; ecologically destructive agricultural and grazing practices; water pollution; depletion of sea resources (particularly fisheries); loss of the potential offered by renewable natural resources (particularly flora and fauna); problems arising from the exploitation of non-renewable mineral resources; problems of oil production and refining.

(iii) Industrialization

- industrial development was more a potential than an actual threat in many less industrialized countries;
- since many of the industries in these countries were of small or medium size, their financial resources were limited and they were unable to install anti-pollution equipment or plants;
- the importance of planned land use and location of industries and control of waste disposal were stressed;
- the environmental problems resulting from industrial activity were due to the use of techniques originating in industrialized countries;
- countries should adopt an inter-disciplinary approach to the planning of new or the expansion of existing industries;
- in addition, a number of more specific problems arising out of industrial development were discussed. These included: industrial pollution (source and extent); location of industries; size of industrial units; technologies of pollution; industrial transport services; adaptation of industrial workers to industrial processes and machines; industrial hazards; wastes and effluents discharge; financial problems facing small and medium scale industries in preventing pollution.

(iv) Education and training of environmental manpower

8. The basic principle underlying the discussion of this subject was the importance of better knowledge of environmental problems and the necessity to communicate this knowledge through educational and training systems.

- in this connexion the need to make an inventory of manpower requirements and to establish training and educational infrastructure in rural areas was established;
- particular stress was laid on training in natural resources management;
- the need to educate the public so as to improve the general attitude towards maintaining a better environment was also singled out.

D. The environmental strategy of the developing countries.

9. The regional seminars adopted a dynamic and positive attitude to actions they could promote to face the new concern about the environment. Actions in three major areas were considered.

(i) The incorporation of environmental considerations in development planning

10. The participants agreed that environmental concerns should be integrated in overall planning and development strategies.

11. More specifically, the integration of environmental concerns in development planning implied that:

- project appraisals should include assessments of the environmental impact of the projects;
- alternative investment projects should specify the differences in their effects on the environment;
- direct controls or fiscal measures should be used to prevent the demand or supply of products which were not considered essential and had harmful effects on the environment;
- adequate physical planning should be made, taking spatial and locational aspects into account;
- planning should be strengthened and competence created at the regional and local levels to undertake overall planning and environmental management and control;
- the allocation of resources should be based on a careful analysis and comparison of costs and benefits.

12. It was agreed that environmental problems should be dealt with as an integral aspect of development. For that purpose steps should be taken to establish appropriate machinery for environmental planning, management and control, which should work closely with the machinery of planning for economic and social development.

(ii) Regional co-operation

13. The seminars stressed the importance of regional co-operation to achieve common environmental goals: regional co-operation to support national environmental policies could be conducted through; institutional arrangements to deal with common environmental problems.

- regional institutions could serve as a forum through which research, training, and exchange of information on environmental problems of the region could be stimulated and organized;
- they could also undertake studies on environmental problems in border areas and on the high seas;
- they could attempt to reach common criteria and concepts in the environment field;
- to accomplish these tasks regional institutions should include in their staff environmentalists and natural as well as social scientists;
- their activities should be in harmony with any global system set up within the United Nations system.

14. The organization of technical seminars and other meetings on environmental issues so as to enable countries in each region to exchange views on problems of common concern.

15. The participation of United Nations regional organizations, particularly the regional commissions and the planning institutes, in all activities related to environment.

(iii) International co-operation

16. It was recognized that the basic principle underlying international co-operation was that all international efforts for environmental protection and improvement should be based on the sovereign rights of each nation.

17. The seminars agreed that the less industrialized countries should be prepared to deal with the possible impact of measures being taken by industrialized countries in dealing with their environmental problems.

- detailed commodity studies and a careful monitoring of possible increases in trade barriers on grounds of environmental concern, would be needed. The need for additional international funds to finance environmental projects and programmes was recognized;
- to this end, the establishment of a special fund was recommended.

18. The seminars gave support to all measures tending to improve, at the international level, knowledge of environmental problems and to disseminate such knowledge to all nations.

19. They stressed that the less industrialized countries should be able to select, adapt and develop technologies suitable to their conditions.

20. Since environmental considerations were likely to affect the patterns of international investment, the seminars recommended that the less industrialized countries explore the possibilities of increased participation in certain industrial sectors which were becoming more costly for developed countries because of the higher cost of environmental protection.

- as recipients of foreign investments the developing countries should, however, lay down specific environmental standards to avoid or minimize the possible indiscriminate export of pollution.

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United Nations
Conference on the human environment

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# International organizational implications of action proposals

(subject area VI)

only one earth

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# INTERNATIONAL ORGANIZATIONAL IMPLICATIONS OF ACTION PROPOSALS

## (Subject Area VI)

## Report by the Secretary-General

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## Chapter I

## THE APPROACH

1. One of the underlying premises of the preparatory work for the Conference, and particularly of the discussions of the action proposals to be considered at Stockholm, is that the effectiveness of international co-operation in the field of the human environment will largely depend on the existence of suitable institutional arrangements. The Preparatory Committee accordingly recommended the inclusion in the Conference's agenda of an item on organizational matters, which will enable the Conference to consider all the institutional implications of its decisions with a view to ensuring their prompt and adequate implementation.

2. It would not be desirable, at this juncture, to set out precise suggestions on institutional matters. Pending the adoption by the Conference of concrete decisions on substantive matters, including the proposed Action Plan, the purpose of this paper is, in the main, to provide governments with background material and basic alternatives that may be helpful in considering organizational questions and in formulating policy in respect of them. The paper contains general information and certain relevant considerations regarding the structure, principles and practice of the United Nations, and outlines some of the courses open to the Conference in this context.

3. In preparing this paper, the secretariat has drawn upon the whole of the preparatory process as it has unfolded to date, as well as on the broad experience of the various components of the United Nations system which are currently dealing with environmental problems. A description of the current and planned activities of the organizations of the United Nations system is included in the consolidated document prepared by the Administrative Committee on Co-ordination,1/ which should be read in conjunction with this report.

### A. The need for new approaches

4. The management of environmental problems entails new and complex tasks at all levels of society. As has frequently been stated in the course of the preparatory

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1/ Consolidated document on the UN system and the human environment, submitted by the Administrative Committee on Co-ordination (A/CONF.48/12).

work for the Conference, the term "Human Environment" is being applied to a broad range of individual but interrelated problems and issues, many of which have been dealt with individually for a long time. Both nationally and internationally, the picture that presents itself is one of activities in which there are intrinsic cause and effect relationships that are not adequately reflected or co-ordinated at the level of policy formulation or implementation.

5. Increasing concern for the problems of the human environment, and the growing awareness of the essential interrelatedness of many of these activities has led many governments to adopt, at the national level, measures designed to achieve policy cohesion and better co-ordination of such activities. It is understandable, therefore, that governments have begun to see a need for similar action at the international level. Indeed, it has been repeatedly pointed out, both in and outside the Preparatory Committee, that global environmental problems cut across traditional disciplines and functions. Moreover, they involve dynamic and inter-acting cause and effect relationships which transcend conventional sectoral and institutional boundaries. International co-operation in the environmental field thus points to the need to consider to what extent existing international organizational structures and methods of work are suited to the adoption of concerted and effective action.

## B. Criteria for international organizational arrangements in the environment field

6. The Preparatory Committee for the Conference has therefore given to the secretariat only very general guidance as to the type of organizational arrangements that are envisaged to give practical effect to the decisions to be taken by the Conference. The Committee has taken the position that "form should follow function", and has agreed that a full discussion of organizational implications should take place at its fourth session.[2] The Committee, nonetheless, did express general agreement with the criteria that the Secretary-General of the Conference had proposed in his report to the third session.[3] They are reproduced below because of the generally positive response that they received from the Committee and because they seem to constitute an appropriate starting point for further discussions.

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[2] Cf. A/CONF.48/PC.13, para. 145.

[3] Cf. A/CONF.48/PC.11, para. 222.

7. The criteria read as follows:

(a) any organizational arrangements should be based first on agreement about what needs to be done. Until this is reached, no firm decision can be made on the ways and means to be adopted;

(b) all functions that can best be performed by existing organizations should be assigned to those organizations, both international and national, most capable of carrying them out effectively. No unnecessary new machinery should be created;

(c) it is more logical to consider a network of national, international, functional and sectoral organizations with appropriate linkages and "switchboard" mechanisms, whereby international organizations supplement and complement national organizations, than to think in terms of a global "super agency";

(d) any action envisaged should allow for the preliminary state of knowledge and understanding of environmental problems, and should be flexible and evolutionary;

(e) governments will want to attach highest priority to the need for co-ordination and rationalization of the activities and programmes of the various international organizations active in the environmental field. This is essential in order to avoid overlap and duplication and to assure most effective use of scarce resources of money and manpower;

(f) any policy centre that is expected to influence and co-ordinate the activities of other agencies should not itself have operational functions which in any way compete with the organizations over which it expects to exercise such influence;

(g) in the establishment of any additional or new machinery it is essential to provide strong capability at the regional level;

(h) the United Nations should be the principal centre for international environmental co-operation;

(i) the organization of environmental activities within the United Nations should be so designed as to strengthen and reinforce the entire United Nations system;

(j) environmental problems and situations vary greatly among nations and any organizational arrangements contemplated must necessarily bear this fact in mind.

## C. The United Nations system

8. The convening of the Stockholm Conference attests to the ability of the Organization to reflect the concerns and preoccupations of the world community and constitutes a manifestation of its readiness to accommodate a wider range of interests and problems. The Conference will undoubtedly indicate that individual governments conceive international action in connexion with problems of the human environment in different ways. Over and above such differences, however, it appears that the practical operation of any institutional arrangements that the Conference may see fit to recommend will involve a historical challenge to the process of multilateral co-operation inherent in the United Nations.

9. To the extent that further work regarding the human environment would add a new dimension to the system of international co-operation embodied in the Charter, the recommendations of the Conference on institutional matters should therefore evidence the capacity of that system, as a whole, to introduce adjustments to serve specific needs and to adapt itself to changing circumstances. For progress towards a peaceful and prosperous world means, inescapably, progress towards the evolution of international institutions capable of facilitating better management and planning of man's impact on the earth.

10. It may be relevant to stress, in this context, that the constitutional strengths, and weaknesses, of any international organization are, in the last analysis, in the hands of governments. The powers which it exercises are those which governments have vested in it; the powers which it lacks are those which they have withheld from it. In formulating its recommendations to the General Assembly on institutional questions within its competence, the Conference therefore bears a heavy responsibility.

## D. The problem of co-ordination

11. Co-ordination is not just a necessary aspect of environmental management - it is its very essence. For, as noted earlier, environmental issues involve the management of a whole series of relationships touching upon all facets of human activity. International co-operation in the field of the human environment therefore poses

particularly complex problems of co-ordination. It could even be argued that the existing system of functional decentralization of responsibilities does not lend itself to the most effective management in this context.

12. This is not, however, the first time that the United Nations system has been confronted with the need to tackle problems of a multi-disciplinary character. A notable feature of the evolution of international economic co-operation in the decade of the 60's was the sustained effort made to enable each of the component organizations to contribute, through concerted approaches, to the achievement of common goals. This was brought about, in particular, by the need to initiate new tasks of an intrinsically inter-disciplinary nature such as those arising out of the pledges made by the international community to support the development endeavours of a large number of developing countries, as well as those deriving from the progress made in science and technology. The International Development Strategy, and the arrangements made for review and appraisal of progress in its implementation, readily spring to mind as the culmination of that process, and as one indication of the desire to give coherence to the system in the light of the requirements of the contemporary world community. The consensus adopted on the structure and operation of UNDP is another example which is particularly relevant to any discussion of concerted activities.4/

13. This should not, however, in any way, be construed as an underestimation of the problem. By virtue of the very nature of the problems of the human environment, co-ordination will be particularly difficult - and inadequate co-ordination in this field could therefore lead not merely to misuse of scarce resources, but frustration of the main purposes of the activities concerned. Notwithstanding its many shortcomings and serious defects, however, it should be emphasized that the United Nations system has been responsive to new requirements, and has shown that it can be adapted to serve the objectives that governments will set themselves at Stockholm.

14. It thus seems that what is necessary, besides the adoption of broadly agreed policies - which is an essential precondition of good co-ordination - is the effective performance by the United Nations of the central leadership role which devolves upon it in this respect. The Conference may wish to bear this in mind in setting forth the

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4/ E/4884/Rev.1.

functions of any intergovernmental organ which might be entrusted with decision-making and policy-review responsibilities in the field of the human environment. For, within the broad mandate for co-ordination assigned to it in the Charter, it should be possible for the Organization to introduce suitable methods to achieve the high degree of concerted action that the problems of the environment demand. This might indeed be an opportunity to take concrete steps to close the gap that so often exists between principles and practice of co-ordination, as well as the occasion to give practical meaning to the modern conception of co-ordination as a built-in substantive ingredient of any programme.

15. This would in turn accelerate the shift in emphasis away from the mere reconciliation, *a posteriori*, of jurisdictional conflicts towards a system of co-operative action which, beginning at the planning stage, seeks to achieve maximum results in programme development and execution as well as in resource utilization. Co-ordination then becomes a means to an end, not an end in itself, and if the Stockholm Conference agrees to recommend the establishment of an environment fund - discussed elsewhere in this paper - it should be administered in such a way that it would constitute an additional means to achieve effective co-ordination and a proper allocation of available resources.

16. Whatever arrangements are made at the international level, environmental co-operation will only function properly if there is effective co-ordination within national governments. Governments need a national basis for effecting international co-ordination and one of the greatest contributions of the Stockholm Conference might therefore be that of encouraging more governments to establish or strengthen focal points in their national administrations for the co-ordination of environmental action, both domestic and international. Only thus will governments succeed in maintaining in all the governing bodies of the international agencies a consistent set of policies and objectives. It will be for each government, of course, to decide on its specific requirements and policy-making procedures, but agreement at Stockholm on the importance of co-ordination at the national level will constitute, by itself, a significant step towards the establishment of a solidly built framework of international action.

## E. Relations with intergovernmental and non-governmental organizations

17. A large number of intergovernmental and non-governmental bodies outside the United Nations system have developed extensive activities relating to the human environment. The contributions made by these organizations to the preparations for

the Conference are a significant indication of their potential to carry out work of paramount importance to the success of multinational action in this field. International co-operation in dealing with environmental concerns provides a major opportunity to work out new and effective means of associating more fully these organizations with the United Nations family.

18. United Nations practice regarding formal relations with intergovernmental bodies which are not part of the system in the economic and social field is rather limited. Chapters IX and X of the Charter, which deal with international economic and social co-operation, make no reference to the subject, and the rules of procedure of the General Assembly and the Economic and Social Council make no provisions for the participation of intergovernmental organizations at their meetings. Although the Assembly and the Council have made special arrangements for representation at meetings, no action has been taken to codify rules and practices in a general statute.

19. UNCTAD was the first United Nations organ with world-wide responsibilities required to establish a procedure for relationswwith intergovernmental bodies not part of the system, and other organs, like UNIDO, have adopted similar procedures. It might be possible therefore to build upon the practical experience of these organs in their respective fields and devise pragmatic relationships with bodies dealing with problems of the human environment. Such relationships would seek to achieve, on the one hand, proper co-ordination of work and, on the other, a suitable degree of inter-action which would lend further impetus to the activities of the United Nations system and those bodies.

20. The Charter does provide, in Article 71, for consultative arrangements between the United Nations and non-governmental organizations and a wealth of experience is available which could profitably be used to take advantage of the potential of such bodies. The environmental field presents many new opportunities to utilize the resources and energies available in the non-governmental community in ways which can complement and support the work of the United Nations system in this field. Not only can they perform a variety of specific functions in areas where they have special competence, but they can also play a major and indispensable role in the vital field of education.

## F. Regional co-operation

21. As stated in the criteria, it will be necessary to place considerable emphasis on action relating to environmental matters at the regional level. Many of the conditions affecting the environment have a distinctive regional character and, therefore, the

specific problems of each of the regions of the world will often respond best to a regional approach. Patterns of intergovernmental organization differ markedly in the major regions of the world, as do their relations with the scientific communities of the respective areas. No standard format for regional environmental organization can be suggested that is uniformly relevant; the organizational pattern will inevitably differ greatly from one area to another, and from one subject-focus to another.

22. Whether to build on existing organizations or to start afresh is a matter for governments of each region, which will no doubt wish to consider, in the first instance, the potential of the regional economic commissions and of the United Nations Economic and Social Office in Beirut to deal with problems of the environment. The regional commissions have made very valuable contributions to the preparations of the Conference - notably through the ECE Symposium on problems relating to environment and the seminars convened by the other regional commissions and UNESOB. Moreover, ECE has already set up a body of "Senior advisers to ECE governments on problems relating to environment", which will be addressing itself to a dynamic work programme, and ECA, ECAFE, ECLA and UNESOB are actively considering institutional and administrative adjustments to meet the requirements of regional work on environmental problems.

23. The regional organization of environmental activities also provided both a new need and a new opportunity for the development of close and co-operative relationships between the regional members of the United Nations system and other non-United Nations regional organizations with interests in the environmental fields. An important beginning has been made in this direction by the active participation of several such regional organizations in the preparatory work for the Conference.

## Chapter II

## NEW FUNCTIONS REQUIRED AT THE INTERNATIONAL LEVEL

24. As noted above, a full description of the functions presently performed by the various organizations of the United Nations system is contained in the consolidated document prepared by ACC. When agreement on measures for international action has been achieved, governments will have a range of options open to them regarding the order and timing in which such actions are to be put into effect. At this stage, it can only be assumed that priority needs for further action will fit into broad functional categories. What follows is an outline of the new environmental activities that would now seem to be required, and of the supporting actions that may be needed.

### A. The knowledge acquisition and assessment function

25. This general function would include four subsidiary categories of functions, namely evaluation and forecasting, research, monitoring, and information exchange.

### (i) Evaluation and forecasting

26. The state of the environment and its changes with time can only be described in terms of a large number of widely diverse variables. Clearly the scientific and technical evaluation of research findings and data relating to any variable must normally be carried out by the organization with the necessary professional competence to study it. There remains however the vitally important task of determining priority needs and of relating these specialized evaluations to the broader concerns and issues which have important policy implications for the international community. This involves giving proper perspectives, and calling the attention of governments, to significant trends, pointing out present and potential problems and opportunities of international importance as well as possibilities for corrective and preventive or anticipatory action.

27. These functions can only be performed at the international level by a body which is not tied to any individual sectoral or operational responsibilities and is able to take an objective overall view of the technical and policy implications arising from a variety of multi-disciplinary factors.

### (ii) Research

28. One of the principal needs identified in the preparatory process is for new or improved knowledge in a number of important areas. While most of the research required to meet these needs will be carried out nationally and such research as is

conducted internationally may be carried out by existing organizations - both inter-governmental and non-governmental - there is an important additional requirement at the international level for a means of facilitating environmental co-operation by:

- identifying needs that are common to a number of countries and that can most effectively and economically be met by co-operative use of facilities and personnel;
- arranging multinational support for programmes designed to meet common needs;
- providing a continuing over-view of existing programmes and needs to assist governments and international organizations in making best use of available resources.

29. These functions would complement and support the important work of existing United Nations bodies, which would, of course, continue. But the performance of such functions by one designated body of the United Nations would provide the coherence and overall co-ordination of the environmental research activities within the United Nations system that is so essential.

(iii) Monitoring [5]

30. Monitoring is one of the most important activities which requires international co-operation for effective operation. Most environmental monitoring programmes will be carried out by national and international organizations which have the specialized competence and facilities required to perform particular functions. Co-ordination at the international level will continue to be exercised by organizations according to sectoral responsibilities, e.g. by WHO for public health effects, by WMO for meteorological aspects. However, in order to integrate these effectively on global scale, making the best use of all available facilities, it seems necessary that there be a central point in the international system for the overall co-ordination that is needed on a continuing basis.

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[5] "Monitoring" is here taken to mean the collection of "base-line" environmental data and of information on changes in the quality of media which, directly or indirectly, may significantly affect the health or well-being of man. It does not connote the policing or surveillance of compliance with regulations or standards, though information obtained by monitoring will be a valuable indication of the effectiveness of control measures.

(iv) Information exchange

31. New functional responsibilities should be allocated for the accumulation and exchange of environmental information at the international level. Here again, the need is for a central point of reference both for the various components of the United Nations system and for governments, non-governmental organizations and the scientific community. The need for a data storage and retrieval mechanism is only part of the requirement. There should also exist, if this function is to be properly fulfilled, a capacity to develop standardization and comparability of data through intercalibration of methods. This involves an active role of consultation with research centres and other sources of environmental information.

32. The information exchange function would also include collection of information on environmental systems management both at the level of theory (formulation of general principles regarding economic and social activities, dysfunctions and planning measures and systems) and of operational practice (collection of technical-commercial data, information on legislation, institutional innovation, the operation of official controls, norms and standards, etc.).

33. Some of the latter functions fall appropriately within existing United Nations organizations. However, the receipt, classification and transfer of such information should be systematized, and a central environmental body should have the resources and capability to promote such systematization.

B. The environmental quality management function

34. This general function includes three subsidiary categories:

(i) Goal setting

35. There will be a growing need to provide a broad international basis for establishment of goals for the improvement of environmental quality. Such goals may be established internationally in a number of ways including:

- non-mandatory recommendations and guidelines;
- proposed uniform national codes for environmental protection;
- international agreements (treaties, conventions, etc.).

36. It should be emphasized that this vast range of possible new international agreements must be very largely administered and monitored at the national (or sub-national) level. In the great majority of instances the international institutional function would be primarily the provision of a forum for international considerations and ultimately agreement on these matters.

#### (ii) Consultation on proposed actions affecting the international environment

37. In addition there is a growing need to facilitate and promote international consultation over proposed environmental actions of concern to the world community. Such consultations would generally occur on an *ad hoc* basis, as particular issues of potential international environmental hazard arose.

#### (iii) International agreements

38. As and when new areas of international environmental concern become ripe for international agreement, a forum will clearly be required within which such agreements can be developed. This process is already occurring as a result of the preparations for the Conference as evidenced by work on conventions on marine dumping, conservation of wetlands, etc. There will inevitably be many other cases for which similar functions will in the future need to be fulfilled within the United Nations system.

### C. Prevention and settlement of disputes

39. It is unfortunately probable that international disputes over environmental issues are likely to increase in the future. There seems to be widespread agreement that emphasis should be placed on preventive environmental diplomacy -- on measures to avoid environmental conflicts which could trouble international relations and might even threaten international peace. Performance of the function outlined above could make a major contribution to this objective particularly by facilitating consultations amongst governments and providing advisory services to governments.

40. Progress towards this objective might be made even more effective if a procedure were to be agreed upon under which Members of the United Nations would make periodic reports to the Secretary General on all activities by themselves or their nationals that could have a significant environmental impact beyond their borders, and would declare themselves available to consult in good faith with other Members or international agencies which wished to present comments or raise questions about such activities. A procedure of this kind would represent an institutionalization and further development of the national reports utilized in preparation for the Stockholm Conference.

### D. International supporting actions required to help countries both to acquire and assess knowledge and to improve environmental management

41. This general function would include three subsidiary categories of functions:

#### (i) Technical co-operation

42. First and foremost among the measures needed to enable developing countries to improve and protect their human environment is the provision of far greater flows of

international development resources which will bring environmental improvements to the lives of the largest part of humanity. The environmental concern also has particular functional implications for national governments which may require technical assistance from international sources, especially in:

- formulation of appropriate environmental guidelines for international and national development programmes;
- provision of support for education and training of environmental professionals including environmental education in schools and universities;
- provision of the resources - both human and financial - necessary to integrate environmental considerations into development programmes. This should include technical assistance in assessing and offsetting the economic and social impact of other nations' trade and investment controls to protect their environments.

43. New international environmental functions which come under the above heading of technical co-operation, and which governments decide to assign to the United Nations system, should normally be organized and executed by the existing technical co-operation services of the organizations of the system.

(ii) Education and training

44. International activity in the field of environmental education and training would be in the nature of action in support of environmental quality management. However, in this area, as elsewhere in international action in support of environmental quality management, a central environment body in the United Nations would be necessary for the consideration of environmental education priorities, for the identification of international needs for manpower resources especially among environmental professionals, ecologists and multidisciplinary planners, and facilitating arrangements for meeting these needs.

(iii) Public information

45. It is vitally important to the success of all national and international environmental efforts that adequate resources be available for activities that will help to develop a global environmental consciousness. International agencies can make an important contribution to public understanding of environmental problems through publications, conferences and use of mass media. It is equally important that the specialized information and resources available to a central environmental body be fully utilized in providing support and guidance for the vital public information task.

## Chapter III

## THE BROAD INSTITUTIONAL ALTERNATIVES

46. It is necessary to emphasize again that the characteristics of any institutional arrangement depend upon the scale and nature of the problems and issues as conceived by governments as well as upon their agreed position regarding the extent and type of the required multilateral action. A certain degree of consensus on these essential matters must therefore precede any agreement on detailed arrangements.

47. The preparatory work for the Conference has already contributed significantly to the elucidation of fundamental issues relating to the human environment and has increased the awareness and concern about the problems that they pose. On the other hand, the broad agreement reached within the Preparatory Committee on the criteria for institutional arrangements - which is reproduced in Chapter I - constitute a good basis for the adoption of constitutional and institutional formulae which would take into account differences that may prevail in this context.

48. While it would be premature to outline the one institutional framework which would adequately meet the objectives and needs of international co-operation in environmental matters, an effort has been made to indicate some broad options which may assist governments in reaching agreed conclusions. What now seems to be required is an institutional pattern that fills important gaps in the existing structure, minimizes overlapping and duplication, makes the most effective use of limited personnel and financial resources, and takes needed initiatives on priority tasks.

49. In connexion with those functional areas where machinery already exists, but in which activities related to problems of the human environment have not as yet started, or are not as yet given adequate priority, it appears safe to assume that the Conference will wish to suggest the adoption, by the competent governing bodies, of measures designed to give proper emphasis to environmental questions. The precise nature of such recommendations will necessarily stem from the conclusions reached by the Conference as to the type of actions required. The options that follow refer to those functions in regard to which it appears that the United Nations should consider special institutional arrangements.

## A. Central policy review and co-ordination

50. There seems to be widespread agreement on the need for an intergovernmental body to perform the functions of central policy review and co-ordination referred to in Chapter II. Such a body would, of course, require adequate secretariat services to provide the necessary substantive support and technical expertise.

51. The principal task of the intergovernmental body would be to review all the environmental activities of the system and related organizations and establish policy guidelines regarding on-going and planned programmes of work in the field of the human environment, bearing in mind the need to achieve proper co-ordination. This function could be performed on the basis of periodic reports on various aspects of the world environment and of other special studies prepared by the secretariat on particular issues and problems. It would be of paramount importance to ensure that the institutional arrangements establishing the intergovernmental body be such as to enable governments to agree on an appraisal of new issues and problems requiring multilateral consideration and action.

52. The intergovernmental body could be given the power to recommend to its parent organ the convening of special conferences to consider, in depth, specific problems within its competence. It could itself be authorized to call ad hoc meetings to study particular questions of special technical interest and importance.

53. It could be given the power to designate the organizations outside the United Nations system which shall be associated with the work related to problems of the human environment and to establish, or recommend the establishment of, intergovernmental expert groups to review broad categories of problems (such as was done in the case of ionizing radiation when the General Assembly created the United Nations Scientific Committee on the Effects of Atomic Radiation).

54. It would provide overall direction to the secretariat in carrying out its environmental tasks.

55. Should an environment fund be established, the intergovernmental body could also exercise overall policy guidance and supervision regarding the operation of such a fund.

### (i) Intergovernmental arrangements

56. The first question that would arise in the consideration of this matter would be that of the location of the intergovernmental body within the Organization. The experience and legislative history of the last few years would suggest that two main alternatives could be considered in this regard: establishment of (a) a subsidiary organ of the Economic and Social Council or (b) a subsidiary organ of the General Assembly.

57. In support of the first alternative it can be argued that, in many essential respects, the problems of the human environment fall within the competence of the Council, as defined in the Charter, and that the interrelated issues of environment, development, and science and technology, should be dealt with in the same body. The Council is at present undergoing a fundamental process of change, having adopted far-reaching proposals designed to enhance its role as a principal organ of the United Nations - responsible, inter alia, for overall co-ordination in the economic and social field - and to improve its methods of work in order to enable it to discharge more effectively the functions conferred upon it "in the formulation of general economic and social policies to meet the challenges of the modern world".[6] The Council's wide sphere of work has recently been further broadened by the establishment of three committees to deal, respectively, with natural resources, science and technology, and review and appraisal of the International Development Strategy.

58. If this alternative were adopted, the Council could be invited to establish another committee at the same level as the three mentioned above. Another course to which the Council no longer seems inclined to have recourse to, but which is provided for in the Charter, would be the establishment of a commission under the terms of Article 68 of the Charter, which would have a status similar to, among others, the Statistical Commission, the Human Rights Commission and the Commission on Social Development.

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[6] Economic and Social Council resolution 1621 (LI).

59. The second alternative would be to establish a subsidiary organ of the General Assembly in accordance with Article 22 of the Charter. The Assembly has made extensive use of this provision, in connexion with virtually all subjects within the competence of the United Nations. Conspicuous in this category are the United Nations Conference on Trade and Development (UNCTAD)[7] and the United Nations Industrial Development Organization (UNIDO).[8] Other examples of the same approach are the United Nations Children's Fund (UNICEF),[9] the United Nations Relief and Works Agency for Palestine Refugees (UNRWA)[10] and the United Nations Development Programme (UNDP).[11] A number of constitutional and political considerations were invoked at the time of the adoption of these institutional arrangements. It does not seem necessary, however, to endeavour to reproduce these considerations, particularly because most of them were related to specific aspects of the respective fields of competence of the organs concerned, and because others are no longer relevant, having been superseded by subsequent events and decisions, such as the enlargement of the membership of the Economic and Social Council.[12]

60. The fact that the Assembly is the parent body of organs such as UNCTAD, UNIDO and UNDP, which deal with vital questions of international development co-operation, may be regarded as pertinent to any consideration of the appropriate location in the Organization of an organ on environmental matters. It could also be argued that the human environment transcends, in many important aspects, traditional economic and social values. Thus, establishment of an organ of the General Assembly would enable the Assembly effectively to tackle problems posed by the interconnexion of development with the need to safeguard the environment and to provide policy guidance thereon.

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[7] General Assembly resolution 1995 (XIX).

[8] General Assembly resolution 2152 (XXI).

[9] General Assembly resolutions 57 (I) and 902 (VIII)

[10] General Assembly resolutions 302 (V) and 2452 B(XXIII)

[11] Most recently General Assembly resolution 2029 (XX)

[12] The General Assembly recently decided to adopt, in accordance with Article 108 of the Charter, an amendment to the Charter - and to submit it for ratification by the Member States of the United Nations - whereby the Economic and Social Council shall consist of fifty-four Members. (General Assembly resolution 2847 (XXVI) of 20 December 1971).

61. These considerations might lead governments to the conclusion that it is necessary to adopt a solution under which both the Council and the Assembly would be given an opportunity to review the activities of the system in the field of the human environment. In this connexion, it is pertinent to note that the resolutions of the General Assembly setting up the organs mentioned above contain provisions under which the Council considers their reports, discussed relevant aspects of their work, and in some cases elects the members of their governing bodies. The juridical formula which might serve this purpose could provide that the new body dealing with the environment be established as a subsidiary organ of the General Assembly reporting to the Assembly through the Council. It might also be desirable to specify, in some detail, the role that the Council would be expected to perform in considering the report on environmental matters.

62. Adoption now of such an institutional arrangement would not foreclose any subsequent adjustments called for in the future by changes that might become necessary in the mandate and operation of the intergovernmental organ dealing with the environment - including, perhaps, its transformation into a different type of institution - or indeed by a future decision of the Assembly or the Council as to their own methods of work which might have a bearing on their consideration of environmental matters.

63. If it is decided to recommend the establishment of an intergovernmental body on the human environment it will be necessary to consider its composition. It is not, of course, for the secretariat to advance any ideas in this regard and it will thus confine itself to setting out some relevant factual information. Firstly, it should be noted that the Preparatory Committee for the Conference comprises twenty-seven members. Other bodies, the membership of which may be relevant, are the three aforementioned standing committees recently established by the Economic and Social Council which comprise 54 members, elected by the Council in accordance with its own geographical distribution of seats. The Trade and Development Board of UNCTAD comprises 55 members elected by the Conference with "full regard for both equitable geographical distribution and the desirability of continuing representation for the principal trading States" and, to that end, seats are distributed on the basis of an established pattern and of lists of States contained in the Annex to General Assembly resolution 1995 (XIX). The Industrial Development Board comprises 45 members elected by the Assembly under resolution 2152 (XXV), on a similar basis as that provided for

UNCTAD. Under the terms of resolution 2814 (XXVI), recently adopted, the Governing Council of the UNDP comprises 48 members elected by the Economic and Social Council in conformity with rules regarding the distribution of seats set out in the same resolution.

64. Whatever the size of the intergovernmental body, its effectiveness will be largely determined by the level and quality of participation. The Conference may therefore wish to recommend that - as in certain other areas - governments should appoint as their representatives in the intergovernmental body senior officials or persons with special competence in environmental matters.

(ii) Secretariat

65. The need for the United Nations Secretariat to service the intergovernmental body on the human environment must be dealt with within the context of Article 101 of the Charter. The principal question that arises is whether the secretariat services concerned should be an integral part of the Department of Economic and Social Affairs or a separate unit within the United Nations Secretariat. In choosing between these possibilities it will be necessary to bear in mind the special characteristics of the secretariat required to deal with environmental matters.

66. When UNCTAD was set up as a subsidiary organ of the Assembly it was decided that "arrangements shall be made, in accordance with Article 101 of the Charter, for the immediate establishment of an adequate, permanent and full time secretariat within the United Nations Secretariat ..."[13] and a very similar provision was adopted when UNIDO was set up.[14] In pursuance of these decisions the Secretary-General set up within the secretariat two separate units which for administrative and other practical purposes have the status of a department but which, inasmuch as they service their own governing bodies, are required to operate, in the fields of their competence, under the guidance of those bodies. These two secretariats are headed by officials of Under-Secretary-General rank appointed by the Secretary-General the appointments being subject to confirmation by the General Assembly. The High-Commissioner for Refugees, who is also in charge of a separate secretariat unit, is elected by the General Assembly on the

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13/ General Assembly resolution 1995 (XIX), paragraph 26.

14/ General Assembly resolution 2152 (XXI), paragraph 17.

nomination of the Secretary-General. The Administrator of UNDP is appointed by the Secretary-General after consultations with the Governing Council and subject to confirmation by the General Assembly.

67. A principal task of the secretariat would be to service, both substantively and logistically, the intergovernmental body on the human environment. In that context it would prepare the reports on the world environment and such other studies as may be required, and, generally, provide technical advice on matters within its competence. It would be responsible for ensuring implementation, at the technical level, to all the directives adopted by the intergovernmental organ, the Economic and Social Council and the Assembly regarding co-ordination of work and activities in the field of the human environment. In this connexion, and in order to enable these organs to exercise their leadership role, the secretariat would establish close relations with all related agencies and organizations so as to give practical meaning to the concept of positive co-ordination mentioned in Chapter I.

68. Inasmuch as it will be especially important to ensure that co-ordination starts at the very moment in which a new project and activity is conceived, the secretariat would avail itself, mutatis mutandis, of existing procedures for, and follow established practices of, interagency relations, including, in particular, those regarding prior consultation and exchange of data. Similarly, it will make appropriate administrative arrangements - possibly including secondment of staff - which would ensure the closest possible relations with individual agencies. In these respects, too, the problems of the human environment will require the gradual evolution of new methods of work and the adoption of appropriate systems of substantive consultation.

69. The executive head of the secretariat for the human environment would assist in the implementation of agreed decisions and in finding practical solutions to specific problems. He would bring to the attention of the intergovernmental body matters relating to the human environment requiring consideration by governments. He would endeavour to maintain close relations with the scientific community and should have access to the best available professional resources. Should an environment fund be established, the executive head might be vested, under the general guidance and supervision of the intergovernmental body, with responsibility for the administration of the fund, (see Chapter IV).

### (iii) Relationship with the scientific community

70. The intergovernmental body and secretariat should work in close liaison with the scientific community. The value of developing close working relationships with the various components of the scientific community, such as ICSU and its subsidiary bodies, particularly SCOPE, as well as IUCN, has been concentrated during preparations for the Conference. These working relationships should embrace all branches of the scientific community including medicine and the social sciences.

71. While a single panel of scientific advisers might be created to meet all these purposes, it would seem better to proceed by convening expert groups on an ad hoc basis. Such groups could include, as they have in the preparatory process, experts from the United Nations system, governments and non-governmental sources. In this way, in addition to the support that they would have from other United Nations bodies and services, the intergovernmental body and secretariat would be able to seek advice from those persons whose expertise was most relevant to the particular problem under review. In assessing the risks due to exposure from certain pollutants of international significance (such as heavy-metals, and chlorinated hydrocarbons), it would seem preferable to constitute separate groups of experts rather than rely for the advice on a single overall panel.

72. A proposal to combine many of these functions in a single institution, i.e."an International Centre for the Environment" (ICE), has been discussed in SCOPE. Essentially the same conception has been advanced elsewhere under the title "World Environment Institute" (WEI). However, proposals along these lines have not yet taken very specific form, nor have they been considered in detail in either the scientific community or intergovernmental bodies, and it is not clear how such a centre would be organized and financed.

73. For the immediate future, therefore, insofar as the United Nations system is concerned, more modest and flexible arrangements might be considered for the acquisition and exchange of environmental knowledge, without prejudice to the possibility that a more comprehensive proposal may develop which would merit consideration at a later stage. The responsibility for overall co-ordination and for identifying gaps in the existing monitoring networks could be carried out by the new intergovernmental body and secretariat, in consultation with the agencies concerned. Central data bank facilities could, where necessary, be made available through arrangements with specialized agencies

and the United Nations Office at Geneva. The International Computing Centre (ICC), recently established in Geneva for the collection of economic and social information, could possibly be utilized for this purpose. The encouragement of exchanges of national experience could be performed by the intergovernmental body with the aid of the secretariat.

74. One of the principal deficiencies which the environmental issue discloses in existing institutional arrangements is the inadequate relationship between the scientific community and social and political decision-making processes. This stems in part from inadequacies within the scientific community, and particularly in the relationship between the natural and social sciences, which make it difficult to obtain the kind of consensus within the scientific community itself that would provide clear guidance to political decision-makers on important questions. It also stems from inadequate arrangements in many countries for the kind of close communication and understanding between scientists and political decision-makers that is indispensable to successful environmental management. New institutional machinery should especially be directed towards this problem, recognizing that this is an area in which international efforts can be helpful in encouraging and supporting better relationships at the national level.

## B. The prevention and settlement of disputes

75. In connexion with the prevention and settlement of environmental disputes, it may be recalled that Article 33 of the Charter requires the parties to any dispute, the continuance of which is likely to endanger the maintenance of international peace and security, to seek a solution first of all by "negotiation, enquiry, mediation, conciliation, arbitration, judicial settlement, resort to regional agencies, or other peaceful means of their own choice". Members could be encouraged to have recourse to such procedures for the settling of environmental disputes even where disputes did not actually threaten international peace. Where international agreements are negotiated on particular environmental problems, specific provision could be made, wherever possible for appropriate procedures for resolving disputes over their interpretation.

76. Parties to environmental disputes should have the option of bringing disputes to the environmental intergovernmental body or to other appropriate intergovernmental forums, which could make recommendations for peaceful settlement. Parties to disputes could also make use of the advisory services and good offices of the environmental

secretariat. Non-governmental organizations with special competence in the subject matter should have an opportunity to present their views and, in appropriate cases, advice could be sought from a specially-constituted panel.

77. Some kinds of environmental disputes could appropriately be referred to the International Court of Justice, which has authority under its Statute to make use of scientific advisers or "assessors" to inform itself of the facts. In the case of other environmental disputes, it may be more appropriate to resort to an *ad hoc* arbitral tribunal. In still other cases, it may be preferable to employ non-judicial procedures like negotiations, mediation and conciliation where a flexible adjustment of interests can be achieved through mutual accommodation.

78. In the absence of effective international measures to avoid and settle environmental disputes, governments are likely to resort to unilateral measures to protect their environmental interests, possibly including direct reprisals against other governments, for actions which inflict environmental injury upon them, a retaliation which could have grave consequences. This is another reason why the avoidance and settlement of environmental disputes deserves continuing attention, even if specific machinery for this purpose cannot be established immediately.

# Chapter IV

# FUNDING

## A. Requirements for international financing

79. It is evident that any programme of international co-operation in the field of the human environment that goes beyond current activities will entail additional costs and require additional funds. While most action proposals have not reached a stage of elaboration where detailed cost estimates can be made, it is already clear that the total cost of all proposals being considered for inclusion in the Action Plan will exceed the resources likely to be immediately available to international environmental activities. A special study of the overall range of costs involved is being undertaken and will be available by the time of the Conference. But the matter goes beyond that of funds alone. The access to additional funds by the environmental machinery will give it a greatly enhanced value as an organization, able not only to advise upon, and co-ordinate national, regional and international programmes, but capable of initiating and encouraging other programmes in a practical manner. The new institutional arrangements must be actively involved in world environmental developments; the access to additional funds is crucial to this practical involvement.

80. Clearly, however, it would be necessary to determine first the manner and extent of the additional work that is required, and more particularly, the objectives that should be sought through additional financial resources. To a large extent these objectives arise out of the description of the environmental functions to be performed at the international level, outlined in Chapter II. International financing will be required to meet three essential needs which would arise from approval by the Conference of the Action Plan, incorporating the proposals being submitted to it for consideration.

### (i) Basic costs of the central environmental organ

81. It has been the practice in the establishment of subsidiary organs either to provide that:

(a) all expenses are to be borne by the regular budget of the United Nations; or

(b) administrative expenses of the organ are to be borne by the regular budget of the United Nations and other expenses are to be financed by voluntary contributions; or,

(c) all expenses, both for administration and programme are to be financed by voluntary contributions.

82. Financing procedures in accordance with (a) were adopted in the case of UNCTAD.[15] Examples of subsidiary organs which operate according to the format of (b) are UNIDO and UNHCR. Examples of subsidiary organs which are financed in accordance with (c) are UNITAR, UNICEF, UNRWA, WFP and UNDP.

83. Governments may wish to consider providing that the costs of the basic secretariat - excluding costs of special programme activities - be borne by the regular budget of the United Nations. It may be noted in this respect that the Assembly has decided, in respect of several subsidiary bodies, that there should be a special budgetary provision in the regular budget to defray their administrative expenses. The adoption of such formula would give member governments, and the international civil servants involved, the proper degree of confidence in the continuing concern for multilateral action in the field of the human environment. But nothing in such a type of financing approach would prevent the provision of supplementary funds from voluntary contributions for special administrative and programme-support purposes.

### (ii) Costs of international environmental programmes

84. The performance of the functions outlined in Chapter II would require funds for new international programmes and activities.

85. Assuming that additional financial support for international co-operation in the field of the human environment is forthcoming, the central question that necessarily arises is whether such additional financial resources should be channelled through the regular budgets of the United Nations and the specialized agencies or whether there is a need for a new "Environment Fund" which would operate separately from the regular budgets involved.

86. Several considerations may be seen to weigh against the creation of a separate fund. It could be argued that most of the functions to be performed at the international level can, and should be, financed through assessed contributions. International activities such as oceanographic and atmospheric monitoring depend for their success on assured continuity and it could therefore be stated that if they were financed through voluntary contributions there would always be a danger that such work could be affected or even interrupted as a result of lack of adequate resources. A weightier consideration against a separate central fund might be the danger that it would run into complicated and contentious issues, particularly in deciding which kind of requests for funds are, or are not, justified.

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[15] Subsequently UNCTAD became a participating agency of UNDP in order to perform operational functions within its field of competence.

87. There are, however, at least equally valid arguments to counteract the foregoing, bearing in mind, in particular, the need to make the best possible use of limited international resources. The precedents of UNDP, UNFPA and several other separate funds, constitute a manifestation of a well-established policy of many governments which is designed to supplement assessed contributions to regular budgets through such voluntary contributions to separate funds, as well as an indication of their conviction that it is possible and necessary to strengthen co-ordination through additional separate central funding. In fact, governments may consider that, in the field of the human environment, additional separate central funding provides the best means of achieving positive co-ordination as described in Chapter I and the best use of limited funds.

88. The problem of complexity and of contention in decisions as to what a separate central fund should or should not finance, must be matched against the complexity and contention that might arise from the alternative situation whereby environmental activities would compete for regular budget resources with established and often interrelated priorities within individual agencies, in addition to the well-known problems of ensuring co-ordination through separately funded components.

89. From a policy-making standpoint, separate central funding may have strong appeal to the interests of both developed and developing countries. Developed countries would feel reassured that their contributions are being used specifically for environmental purposes; developing countries would feel greater re-assurance that the costs of environmental activities are being met by the provision of new resources and not through the diversion of existing resources. Inasmuch as the developing countries' full participation in any endeavour of international co-operation for the protection of the human environment is essential, this may, in fact constitute the most important argument in favour of separate central funding. For their priorities are understandably determined by the most pressing development needs and they will often be unwilling or unable to participate in multilateral environmental programmes unless the financial resources that are required are provided from external sources. Separate central funding could thus become the best safeguard of the principle of "additionality" which has been reaffirmed only recently, by the General Assembly.16/

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16/ Resolution 2849 (XXVI).

90. Notwithstanding the apparent balance of advantage in favour of separate central funding of environmental activities, it does not follow that it would be practical or desirable for all environmental activities of the agencies to be financed through such a fund. It would be feasible to consider limiting the separate central funding to the costs of new initiatives and studies, and "seed" money for new programmes, as well as to support of special research, monitoring, information exchange and technical co-operation. This would mean that existing programmes and new programmes after they have been established as an ongoing part of an agency's activities would be financed from its regular budget.

91. The problem as to what activities to fund centrally thus becomes the nodal question. Here again, a gradualist, and flexible approach would be well advised. It has already been mentioned that a separate document is being prepared on this subject.[17/]

(iii) Incremental costs of incorporating environmental measures into development programmes

92. The best means of funding the environmental costs that may result from application of environmental knowledge and its incorporation into the developmental activities of the developing countries raises much larger questions that will require a great deal of close and continuing attention.

93. Support for surveys, studies and pilot projects in resource management, pollution abatement, tropical ecosystems, developing country urban environment problems, etc. should of course continue to be provided by the UNDP, though it is clear that substantial additional resources are urgently needed for this type of "pre-investment" activity.

94. As regards capital costs, the short-run benefits attributable to environmental protection measures will out-weigh the costs in many cases. In such instances, financing of environmental costs would be borne as an integral part of the total costs of the projects concerned. However, the problem, in such cases, might often be to carry out the more comprehensive cost-benefit analysis that will bring these facts to light, and technical assistance in doing this should be available when required.

95. A more difficult case occurs where environmental expenditures will pay out over the long run, but will sharply reduce net short-term benefits. In such instances, there is also a strong case for contributions of additional resources to the International Bank for Reconstruction and Development (IBRD), and to the regional development banks, to enable them to incorporate environmental protection or enhancement features.

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[17/] Cf. para. 79 above.

Experience with development assistance indicates that it has thus far been possible to reach mutual agreement with borrowers on projects in this category, at least as to protection against first order environmental effects. Additional costs have averaged from one to three per cent of total project costs and have been covered by increasing the amount of the loan at regular interest rates. Despite the success of this project-by-project approach so far, there are grounds for concern over the additional costs on an aggregated basis, especially for countries with heavy overall debt burdens.

96. This leaves a class of cases in which the environmental benefits to the country involved are small in comparison with those to other states or the international community at large. If the effect will be felt by neighbouring States, as might be the case with an international river system, the supplier of funds might wish to assure before proceeding with the financing that appropriate arrangements have been made among the states involved as to the apportionment of benefits and burdens. Technical co-operation in preparing the basis of such an agreement would seem to be valid object of support by a central environment fund.

97. Where the international benefits are more general, as for example in the case of the protection of a wildlife reserve, there is a strong argument for paying the cost of protective measures out of international resources.

## B. Administration of international environmental funds

98. If funding of international environmental programmes is carried out through the direct provision by governments of funds to the individual agencies carrying out these programmes, such funds would, of course, be administered as part of their normal management process.

99. As regards the establishment and the administration and control of an Environment Fund, several approaches could be considered but the three following options would seem to be the most relevant:

(a) to follow the precedent used for the Narcotics Abuse Control Fund and the United Nations Fund for Population Activities which were both established by the Secretary-General and are administered by the Secretary-General in the first case and the Administrator of UNDP in the second case. The second case is a more relevant precedent because programme co-ordination with or through UNDP could be arranged by various means. It would be necessary, however, to find a formula that would give the intergovernmental body on the environment the necessary policy-making flexibility while preserving Governing Council control - in order to balance responsibilities. The Governing Council of UNDP would probably expecttto review carefully the use of funds for environment purposes if UNDP were heavily involved. But an important consideration which cannot be emphasized too strongly is that any arrangement which would separate the administration of the Fund from the review of the environmental policy and co-ordination of environment functions would lead to the existence of two entities within the United Nations with all the potential problems of overlapping and duplication.

(b) The Fund could be established by the General Assembly and managed by the intergovernmental body on environment. This formula would have the intrinsic advantage of ensuring governmental control over programme formulation and co-ordination of environmental activities. It does present the obvious disadvantages of lack of flexibility and efficiency in the administration of a fund which will relate to a very wide and complex programme of activities.

(c) A third approach, which might combine all the advantages of governmental policy guidance and of flexible and expeditious administration would be one whereby the fund would be established by the General Assembly and administered by the executive head of the environment secretariat on behalf of the Secretary-General under the overall policy and administrative supervision of the intergovernmental body. To that end, the executive head would submit regular reports to the intergovernmental body and seek from it guidance and instructions regarding the operation of the fund.

## ANNEX

## Organization to deal with marine pollution: a special problem

1. International organizational arrangements to deal with marine pollution will require special attention at the Stockholm Conference.[1] The concern of governments with marine pollution has been manifested in recent General Assembly resolutions, in the Committee on the Peaceful Uses of the Sea-Bed and the Ocean Floor beyond the Limits of National Jurisdiction (the "Sea Bed Committee"), and in the Intergovernmental Working Group on Marine Pollution established in accordance with a recommendation of the Preparatory Committee for the Conference. Although valuable measures of co-operation have already been undertaken to deal with marine pollution it is considered that the existing organizational structure is inadequate to cope effectively with all the relevant aspects of this problem. In this connexion, it is important to recognize that the problem of marine pollution must be viewed not only in relation to the problem of managing ocean resources but also in relation to all pollutants found to be of international significance.

2. By far the largest amount of marine pollution is caused by activities which take place on land or in waters subject to national jurisdiction. The fundamental unity of the environment - in particular the marine environment - and the scale of the activities now undertaken, require, however, that further measures of international co-operation should now be established.

3. Many of these measures may most usefully be instituted at regional level. This is not only because common interests may be more readily perceived at the regional level but because of the different characteristics of different bodies of water. Arrangements are already under way to study and deal with the pollution of certain enclosed or semi-enclosed seas - the Caspian, the Baltic, the North Sea, and the Mediterranean. At Stockholm, governments may wish to encourage these efforts and call for additional measures to deal with other threatened bodies of water where adequate arrangements do not as yet exist.

4. As regards global arrangements, the nature of the arrangements made or to be made may be divided into several categories. There is the question of the overall legal framework, which is the concern of the Sea Bed Committee, as the preparatory

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[1] See also A/CONF.48/8, chapters IV and VIII

body for the 1973 Conference on the Law of the Sea. There are arrangements or proposals for regulating particular activities or sources of pollution, most notably the International Convention for the Prevention of Pollution of the Sea by Oil (1954), as subsequently revised, which has been dealt with by IMCO, and a draft convention relating to the control of ocean dumping, which has been considered by the Intergovernmental Working Group on Marine Pollution. Of particular interest to the Stockholm Conference is the question of the institutional arrangements to be made with regard to the monitoring of marine pollution and the collation of relevant scientific data. This matter has been a special concern of IOC.

5. A considerable number of organizations in the United Nations system are presently concerned with the marine environment. In addition to the United Nations itself, FAO, IAEA, IMCO, IOC and UNESCO, WHO and WMO are pursuing activities in accordance with their terms of reference in the field of marine pollution. These activities, however, are carried out along sectoral lines and at present no intergovernmental organization has sufficiently wide terms of reference to provide overall policy guidance except with regard to scientific and monitoring activities where a key role is played by IOC, the specialized mechanism supported by organizations whose executive heads participate in the Inter-Secretariat Committee on Scientific Problems Relating to Oceanography (ICSPRO) (UNESCO, FAO, WMO, IMCO, UN).

6. As regards, first, the activities of the United Nations, the General Assembly has shown its interest in this topic on several occasions, most notably in adopting resolution 2566 (XXIV) on the prevention and control of marine pollution. More broadly, a distinction may be made between "standing" arrangements, centred on the activities of the Economic and Social Council or of its subsidiary bodies, and the work of other organs such as the Conference on the Human Environment and the Sea Bed Committee. The Economic and Social Council, in dealing with the general question of the development of mineral resources, has given increasing attention to the environmental aspects of their rational development. In particular, it has dealt with the subjects of the exploration and exploitation of marine resources in various resolutions and reports. These have included considerations related to marine pollution. Moreover, under the mandate given it by the Charter, the Economic and Social Council has kept under continuous review the co-ordination of United Nations organizations in matters related to the marine environment.

7. Within the framework of the Conference on the Human Environment, the Intergovernmental Working Group on Marine Pollution established in accordance with a recommendation of the Preparatory Committee has examined proposals for an international convention to regulate ocean dumping - the transportation by ship of

waste materials from the land for dumping at sea as well as considering the formulation of various principles relating to marine pollution. As regards the ocean dumping proposals, under one proposal which was submitted to the Group, responsibility for administering a convention on this particular form of pollution would be entrusted to the international organization created as a result of the Law of the Sea Conference and, pending the creation of such an organization, to a General Conference of contracting parties. An alternative possibility would be to entrust the responsibility to IMCO.

8. As previously mentioned, pollutants reaching the oceans from land-based sources through the atmosphere, rivers and direct run-off from land are the most important sources of marine pollution. Insofar as the pollutants, or sources of pollution, in question may affect the atmosphere, or human or other forms of life on land, they have been of concern to the Intergovernmental Working Group on Monitoring; in this context the problem of protection of the marine environment merges with that of protection of the environment in general. These sources, although responsible for the bulk of marine pollution, are subject to little or no form of international regulation. They will undoubtedly have to be dealt with in coming years if the health of the oceans is to be protected. International action could take the form of the establishment of a monitoring system (or of a series of interlocked systems) designed to monitor the extent of pollution from these sources, the creation of standards of water quality for different parts of the marine environment, and, eventually, setting limits on the discharge of particular pollutants.

9. A general obligation to protect the health of the marine environment is contained in Article 25 of the Geneva Convention on the High Seas, paragraph 2 of which obliges States "to co-operate with competent international organizations in taking measures for the prevention of pollution of the seas or air space above, resulting from any activities with radio-active materials or other harmful agents". Although IAEA has established recommended standards relating to the disposal of radio-active wastes produced from peaceful uses of atomic energy and IMCO has pursued its activities designed to curtail or eliminate pollution from specific sources of pollution (most notably from ship-borne oil), in the absence of an organization of general competence in this area, the obligation has so far been of little practical significance.

10. The United Nations body which has been particularly concerned with marine matters in recent years has been the Sea Bed Committee. Originally established, as its title suggests, to deal with the problems which would arise from exploitation of mineral and other resources of the sea-bed beyond the limits of national jurisdiction, the terms of reference of the Committee were expanded by the General Assembly in 1970 so as to make the Committee the preparatory body for a Conference on the Law of the Sea, tentatively scheduled for 1973. Accordingly, the mandate of the Committee was enlarged to include not only pollution from off-shore mineral exploitation but the preservation of marine environment more generally, insofar as changes may be required in the law. Under the first heading, a number of draft conventions have been submitted to the Committee by various States, providing for the establishment of an international sea-bed authority which would, inter alia, have responsibility for pollution occurring on or affecting activities in the area of the sea-bed beyond the limits of national jurisdiction. Certain of these proposals would give the authority functions with respect to the control of marine pollution more generally. As regards the wider mandate of the Sea Bed Committee concerning the law of the sea, the Committee has established a Sub-Committee (composed of all members of the Committee) whose functions are to draft treaty articles on the preservation of the marine environment (including the prevention of pollution) and to promote scientific research.

11. Turning to the specialized agencies and IAEA, their activities relating to marine pollution have been based on their particular spheres of competence. The responsibilities of IOC and IMCO are of special importance, having regard to the central significance of marine questions to these two bodies.

12. The activities of IOC and the supporting ICSPRO agencies concern the scientific investigation of physical, chemical and biological processes in the ocean which help to determine the routes, fates and effects of pollutants, and the problems of monitoring them, and contribute to the protection of living resources. Activities fall into three broad categories: assistance to Member States individually by various agencies in accordance with their terms of reference; promoting collective advancement in methodology, training, research and information services; and assisting concerted action by States through the IOC as in the case of the Long-Term and Expanded Programme of Ocean Exploration and Research (LEPOR) and especially its major component, the Global Investigation of Pollution in the Marine Environment (GIPME).

13. From its inception in 1959, IMCO has exercised not only the depositary functions of the International Convention for the Prevention of Pollution of the Sea by Oil (1954), but also the responsibility for collecting and disseminating technical.

information on oil pollution by tankers. Scientific and technical means for the prevention and control of marine pollution by oil are under continuous review by the IMCO Sub-Committee on Marine Pollution. IMCO is also carrying out work on the identification of noxious and hazardous cargoes which may be considered as potential pollutants. At its 1973 Conference IMCO will consider not only revisions of its 1954 Convention to eliminate all intentional pollution by oil, but also agreements for the elimination of intentional pollution by substances other than oil, for the minimization of accidental pollution by oil and other substances, for the safe carriage of dangerous goods, and for the disposal or treatment of ship-generated sewage or waste.

14. The FAO has been active in the problem of marine pollution for many years because of its direct involvement with the promotion of the world's fisheries. More than a decade ago, it identified the fishery aspects of pollution as follows: harm to the living resources on which fisheries are based; interference with fishing gear and operations; harm to consumers caused by contaminated marine products; and the adverse effects on marketing of the actual or potential reduction of product quality. Since those early days, FAO has broadened its involvement from problems directly influencing fisheries to more general aspects of marine pollution through its regional fisheries bodies and through its support of bodies such as IOC.

15. By statute, IAEA is responsible for establishing standards of safety relating to the peaceful uses of nuclear energy and to the management and disposal of radio-active wastes resulting from the peaceful uses of nuclear energy. Although by far the largest contribution to the radio-active burden of the seas has come from nuclear tests, the peaceful uses of nuclear energy and nuclear techniques have led to the disposal of some radio-active wastes in the sea.

16. The interests and activities of WHO in marine pollution are mainly related to coastal pollution and the health aspects of sea-food products. Its work in this respect falls into four categories: assistance to member countries; research and training activities; the establishment of relevant reference and documentation centres; and co-operation with other agencies. Other WHO interests and activities include comparative studies in water pollution legislation, problems related to waste disposal from ships in harbours and ship sanitation in general. The Organization's activities in these areas are considered to be part of the WHO programme in water pollution control, or to be more precise, as a part of its environmental pollution control programme.

17. The WMO pursues activities relevant to marine pollution since the atmosphere represents a pathway to the oceans for organic and inorganic products released in the air or picked up from the ground by the wind. It is in this knowledge, well documented in the scientific literature of recent years, that the WMO Executive Committee suggested that due account should be given to the role of the atmosphere in the study of marine pollution. There is close collaboration with IOC, especially on monitoring.

18. Having regard to the large number of existing and proposed organizations involved in aspects of marine pollution, there is a strong case for the early establishment of a central point which could provide overall co-ordination of the activities concerned and a measure of policy guidance. Some rationalization has already taken place as far as the scientific aspect is concerned. In order to provide all the organizations in the United Nations system with scientific information concerning marine pollution, a Joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP) has been established under the sponsorship of FAO, UNESCO, WHO, WMO, IMCO, IAEA and the United Nations itself. Members of this group are appointed in their individual capacities and the composition of the group is intended to ensure its essential inter-disciplinary approach. While the administrative secretariat of this group has been entrusted to IMCO, each sponsoring organization has appointed a technical secretary. In addition to the creation of this expert body, however, IOC has been increasingly recognized as the organization which should centralize all information on the scientific aspects of marine pollution. Such a course of action has been emphasized by the recommendations of the Intergovernmental Working Groups on Monitoring and Marine Pollution. Whatever new organizational structure may be considered, IOC would appear to be the logical central organ for the provision of basic scientific information. There is, furthermore, at present a large vacuum in regard to planning as well as regulatory and control aspects, particularly in respect to land-based sources of marine pollution.

19. Looked at overall, the following considerations suggest themselves with regard to possible institutional arrangements: first, the area in which there is most immediate need for further co-ordinated action and for institutional strengthening is with respect to monitoring and, in general, scientific research relating to pollution; second, whatever arrangements are made should be sufficiently flexible so as to permit account to be taken of later developments, in particular the outcome of the Law of the Sea Conference; and, third, consideration should be given to the

problem of ensuring that whatever steps are taken to deal with marine pollution are appropriately co-ordinated, and viewed together, with the steps to be taken to safeguard the environment as a whole. This last consideration applies particuarly to marine pollution caused by land-based sources.

20. On the basis of the above, and having regard to the requirement that the problems of preserving the marine environment have to be considered also in the broader context of ocean space management and the rational development of marine resources and amenities, a flexible institutional framework may be envisaged along the following lines:

(a) An intergovernmental policy body

This should be the intergovernmental body empowered to deal with the problems of the human environment as a whole. Among its functions would be overall responsibility for assuring that needed guidelines were being provided to governments for the control of all sources of marine pollution, including land-based sources.

(b) Secretariat arrangements

These would consist of the environmental secretariat working in close association, perhaps even jointly, with the secretariats of the United Nations agencies and organizations dealing with marine pollution, including, in particular, the secretariat of IOC and the Department of Economic and Social Affairs. Co-ordination would be facilitated if these services were located in close proximity to one another and to the environmental secretariat, and if measures could be taken to strengthen the interagency mechanism known as the Inter-secretariat Committee for Scientific Programmes related to Oceanography (ICSPRO).

(c) Scientific support organs

IOC could provide a central point to arrange for marine monitoring, the collection and exchange of data, the conduct of research, and related technical assistance to developing countries to facilitate their participation in these activities. GESAMP could make periodic qualitative assessments of the risks, pathways and sources of marine pollution.

21. A structure along the lines envisaged would in no way prejudge any future decision which might be taken as an outcome of the 1973 IMCO Conference or of the Conference on the Law of the Sea. At some point in the future it is possible that

consideration will be given to the establishment of some kind of an international authority for the oceans which would inter alia have responsibility for the scientific and regulatory functions discussed above, together with functions relating more generally to management of marine resources. Opting for this solution would clearly be premature at the Stockhom Conference, in view of the major political issues still unresolved and the work proceeding in other forums. Nevertheless, it would be useful to make clear at Stockholm that present institutional arrangements were being made on a provisional basis.

22. If current considerations in various bodies do point to a new intergovernmental body whose responsibilities would include certain aspects of the marine environment, governments should retain the flexibility necessary to re-allocate tasks at a later date. Here again a central mechanism for policy review and co-ordination on environmental affairs may be the most effective place to design the long-term arrangements to deal with marine pollution.

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# United Nations
# Conference on the human environment

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## International organizational implications of action proposals

### Addendum No. 1:
### Views of the Preparatory Committee for the Conference

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# INTERNATIONAL ORGANIZATIONAL IMPLICATIONS OF ACTION PROPOSALS

## Addendum No. 1

## Note by the Secretary-General

The Conference document on international organizational implications of action proposals (A/CONF.48/11) was considered by the Preparatory Committee for the Conference at its fourth session. The Committee also had before it at the time a concise summary of the consolidated document on the United Nations system and the human environment prepared by the Administrative Committee on Coordination.[1]

An account of the discussion by the Preparatory Committee of international organizational implications of action proposals is contained in Chapter III of the report on the session (A/CONF.48/PC/17). This chapter, entitled "International organizational implications of recommendations for action by the Conference, including financial implications" is reproduced as an Annex to the present note in the hope that it will facilitate consideration of this subject at the Conference.

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[1] The consolidated document has been issued under the symbol A/CONF.48/12.

## Annex

## Extract from the report of the Preparatory Committee for the Conference on its fourth session (A/CONF.48/PC/17, Chapter III)

### III. INTERNATIONAL ORGANIZATIONAL IMPLICATIONS OF RECOMMENDATIONS FOR ACTION BY THE CONFERENCE, INCLUDING FINANCIAL IMPLICATIONS

48. The Preparatory Committee considered item 4 of its agenda on the basis of the report of the Secretary-General to the Committee (A/CONF.48/PC/15) and the Conference document on international organizational implications of action proposals (A/CONF.48/11).[1] The Committee also had before it a concise summary of the consolidated document, prepared by the Administrative Committee on Co-ordination (ACC), on the United Nations system and the human environment (A/CONF.48/PC/15/Add.2).[2]

49. In his opening statement to the Committee, the Secretary-General of the Conference strongly emphasized his feeling that Governments were convinced that it was indispensable for an action-oriented conference not only to make recommendations for action but also to address itself to the question of providing the means to implement those actions. He believed that consideration should be given to the provision of adequate organizational and financial means for such implementation.

50. On the subject of organizational means, the Secretary-General of the Conference reiterated the views expressed in the above-mentioned Conference document (A/CONF.48/11) on the need for an intergovernmental body, a supporting secretariat unit and arrangements for access to scientific and technical expertise.

51. Turning to the question of financial means, he stated that studies were under way, and would be submitted by the time of the Conference, to assemble preliminary estimates based on the best available information on costs with regard to proposals for action at the international level. He considered that it was clear, even before an estimation of the total costs of the proposed action plan, that those costs would exceed the sums of money likely to be available and that it would therefore be necessary to establish a means for Governments to decide on priorities for action on a continuing basis.

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[1] Made available to the Preparatory Committee under cover of A/CONF.48/PC/15/Add.1.

[2] Annexes to the summary were available only to the participants at the meeting.

52. The Secretary-General of the Conference emphasized the need for a fund for international environmental activities, as outlined in chapter IV of the Conference document (A/CONF.48/11). He considered that the fund should be justified and utilized on environmental criteria and would be additional to funds already allocated for development assistance. He said that such a fund need not be a large one and could become of the order of 30 to 40 million dollars a year, the greater part of which would have to be contributed by industrialized countries. He further stated that the fund could be administered by the proposed environmental secretariat unit under the policy guidance of the intergovernmental body.

53. On the separate and most important question of additional costs of development projects, he said that, in accordance with paragraph 9 of General Assembly resolution 2849 (XXVI), the Secretary-General would submit to the Conference a report on a scheme of voluntary contributions which would provide additional financing by the developed for the developing countries for environmental purposes, beyond the resources already contemplated in the International Development Strategy for the Second United Nations Development Decade.

54. The representative of the World Meteorological Organization introduced the concise summary of the consolidated document prepared by ACC. He said that the consolidated document, which would be submitted to the Conference under the symbol A/CONF.48/12, and the summary of it (A/CONF.48/PC/15/Add.2) had been approved by ACC in October 1971. He mentioned that Annex II to the consolidated document would not be issued with it but would be available in the Conference library. In drawing attention to the conclusions in paragraph 21 of the ACC summary, he expressed the view that existing mechanisms could well be adapted for the co-ordination of the activities of the United Nations system in the field of the human environment.

55. At the outset of the discussion of this topic in the Committee, a document was circulated at the request of the delegation of the United States containing a draft resolution on funding and institutional arrangements for consideration by the Committee. The document also included a brief statement on the uses to which an environmental fund could be put. At the request of the delegation of the United States, the Preparatory Committee agreed that the document would be reproduced in an annex to the report of the Committee for the record.[3]

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[3] See Annex III to the report of the Preparatory Committee (A/CONF.48/PC/17).

56. Most representatives took part in the discussion of the international organizational implications of action proposals and expressed a variety of opinions on different aspects of the subject.

57. Most delegations agreed on the need to provide continuing institutional and financial means by which to put into effect those recommendations for environmental action at the international level which would be adopted by the Conference. Most delegations also agreed that the United Nations should be the principal organ for international environmental co-operation.

58. It was further agreed that institutional arrangements in the field of the human environment should be essentially flexible and evolutionary so as to permit their adaptation to changing needs and circumstances. It was felt that such institutional arrangements should take into account, as fully as possible, the potential of the organizations of the United Nations system and should make maximum use of existing machinery and resources within and outside the system. It was considered, therefore, that the highest priority should be attached to the need for co-ordination and rationalization of continuing and planned international environmental activities. The view was expressed, however, that given the multidisciplinary nature of environmental problems and the primarily sectoral structure of the United Nations system, it would be essential to go beyond traditional methods of co-ordination. One representative favoured the concept of a "lead agency", that is an agency with responsibility for a particular sector of the environment which would be assigned responsibility for co-ordinating the over-all international programme in that sector.

59. Members of the Committee stressed the need to take into account the regional nature of many environmental problems and of the measures needed to deal with them. It was felt that regional arrangements should be adapted to suit specific needs and interests of each region. Reference was also made to the need for the establishment or strengthening of national machinery for the co-ordination of environmental action and to the special efforts required to that end in developing countries.

60. There was general consensus on the need to establish, within the United Nations, an intergovernmental body to provide broad and continuing policy direction for international co-operation in the field of the human environment. A principal task of the intergovernmental body would be to review the environmental activities of the United Nations system and of other international organizations which perform functions in that field with a view to achieving well co-ordinated and concerted action. It was

also felt that it would be of particular importance to ensure that the institutional arrangements establishing the intergovernmental body would be such as to enable Governments to agree on the periodic assessment of new issues and problems requiring multilateral co-operation and to take necessary initiatives. It was generally agreed that the above need did not require the establishment of a new specialized agency.

61. In connexion with the location of the intergovernmental body within the Organization, two main alternatives were advocated. Several representatives suggested that the intergovernmental body on the human environment should be established as a subsidiary organ of the Economic and Social Council. It was stated in that context that the problems of the human environment fell within the competence of the Council and that the Council would thus be in a position to deal with the interrelated issues of environment, development and science and technology in a proper perspective. It was also pointed out that the Council was in the process of being enlarged and strengthened. Reference was also made to the over-all responsibilities for co-ordination that the Council is required to exercise under the Charter. Several other representatives felt that the intergovernmental body should be set up as a subsidiary organ of the General Assembly as a means of enabling the Assembly, and thus the whole membership of the Organization, to consider environmental problems in a broader context. Those representatives considered that provision should be made for the report of the intergovernmental body on the human environment to be submitted to the Assembly through the Economic and Social Council. One representative suggested that the latter formula might be considered as an interim solution and thus be reviewed before 1975 in the light of experience gained after the first few years and of the capacity of the Economic and Social Council at that time to undertake further important tasks in addition to those recently given to it.

62. Regarding the number of members of the intergovernmental body, suggestions ranged from a body of the size of the Preparatory Committee to one of the size of the recently created standing committees of the Economic and Social Council.4/ It was agreed that the membership of the body should be based on equitable geographical distribution. One representative suggested in addition that the membership should be environmentally balanced.

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4/ Committee on Science and Technology and Committee on Review and Appraisal.

63. There was consensus in the Committee that it would be premature to define at that stage the precise functions and terms of reference of the intergovernmental body as such functions would emerge from the recommendations of the Conference for action at the international level. The Committee agreed that, subject to certain clarifications at the Conference, the functions outlined in chapter II of the Secretary-General's report (A/CONF.48/11) would provide the Conference with a general basis for the elaboration of the mandate of the intergovernmental body. Several delegations emphasized that it would be particularly important for the Conference to define the role of the intergovernmental body in connexion with the environmental implications of development. Some delegations said that the proposed function of prevention and settlement of disputes was one which offered interesting possibilities. Others believed that it would not be advisable or feasible to consider assigning such functions to the proposed institutional machinery.

64. There was agreement among delegations that arrangements should be made for the establishment of a secretariat unit to provide substantive and logistical support to the intergovernmental body on the human environment. It was emphasized that the core staff should be few in number but that the capacity of the secretariat should be commensurate with the requirements of international environmental co-operation. The secretariat would be responsible for ensuring implementation of decisions adopted at the intergovernmental level regarding international environmental activities but it should not assume an operational role in respect of such implementation. Some delegations suggested that the basic costs of the core staff should be borne by the proposed environmental fund; several others considered that those costs should be met from the regular budget of the United Nations so as to ensure the continuity of United Nations concern in the environmental field.

65. Several delegations were of the opinion that the executive head of the secretariat should have the rank of Under Secretary-General of the United Nations. The proposal submitted by the delegation of the United States of America envisaged the creation of the post of Administrator of United Nations Environment Programmes. One representative stated that consideration should be given to the creation of a post similar to that of the High Commissioner for Refugees, who is elected by the General Assembly on the nomination of the Secretary-General. It was felt that, as in the case of the mandate of the intergovernmental body, the responsibilities and title of the executive head and other related administrative provisions should be decided upon at the Conference in the light of its substantive recommendations.

66. The proposal submitted by the delegation of the United States of America envisaged the establishment of an environmental co-ordinating board to ensure maximum efficiency in the administrative co-ordination of United Nations environmental programmes. Such a board would comprise senior executive officers in charge of environmental programmes of the organizations of the United Nations system. That suggestion was supported by some delegations. Other delegations, while stressing the need for effective co-ordination, felt that the need could best be met by adopting existing interagency mechanisms and procedures.

67. It was generally agreed that it was important for the intergovernmental body and its secretariat to secure easy and efficient access to scientific and technical expertise within and outside the United Nations system and that arrangements should be made within the proposed institutional machinery to ensure two-way communication between it and the scientific and technical community.

68. There was widespread support within the Committee for the establishment of a United Nations voluntary fund which, in the view of some delegations, would cover those costs of international co-operation in the field of human environment which would be in excess of currently budgeted expenses for environmental programmes of the organizations of the United Nations system. In that connexion, many delegations expressed appreciation of the initiative taken by the President of the United States of America for the establishment of such a fund and of his intention to recommend to Congress that the United States commit itself to provide its fair share of the fund and hoped that the proposal would receive wide support. Many delegates stated that they were not in a position to comment at that stage on the detailed arrangements for the establishment of such a fund contained in the United States proposal. Some delegates stated that, in the absence of costed action proposals, they were not able to take a position on the establishment of a fund.

69. A number of representatives advanced the view that the executive head of the environment secretariat should be responsible for the administration of the fund and that the intergovernmental body on the human environment should exercise over-all policy guidance and supervision regarding the operation of such a fund. Other delegates emphasized in that respect that the head of the environment secretariat should administer the fund by delegation of authority of the intergovernmental body, to which he would be responsible in that regard. Several delegates stressed that the operations of the fund, and indeed the future budgetary policies of the various organizations of

the United Nations system, should be such as to meet the principle of additionality endorsed by the General Assembly. Some representatives stressed in that connexion that, beyond a possible fund to finance new programmes of the United Nations system in the domain of the environment, additional resources would be needed for direct assistance to cover environmental expenses incurred in development projects of developing countries. Some delegates emphasized, moreover, that it would be essential to ensure not only the full application of the principle of additionality but also that the implementation of environmental programmes would not have a negative effect on the budgets of the organizations of the United Nations system which were devoted to other activities. Other representatives pointed out that, while the proposed fund was not designed to cover the additional cost of development projects as such, it would facilitate the full participation of all countries in international environmental programmes.

70. Two delegates considered that in the current trend of discussion of organizational implications there was the risk that the formulation of conclusions on the form of such machinery would precede decisions on its functions. They believed that further consideration should be given to the various possible institutional alternatives and that it should not necessarily be limited to the alternatives outlined in the Conference document on the subject.

71. Two other delegates were of the opinion that, in addition to the establishment of an intergovernmental body, the United Nations Conference on the Human Environment might be convened every fourth or fifth year. Such a conference would serve to formulate and determine a long-term environmental policy.

72. Some delegates, referring to the annex to the Conference document (A/CONF.48/11) entitled "Organization to deal with marine pollution: a special problem", expressed the view that consideration of the problems of the marine environment should not be separated from that of other environmental questions and that the necessary action relating to human environment should be taken within environmental machinery proposed to be established within the United Nations.

73. In commenting on the section of the Conference document which outlined the functions which were to be carried out at the international level (see A/CONF.48/11, chap. II, section A (iv)), one representative pointed out that the description of the information exchange function in the more recent document (see A/CONF.48/PC/15, paras. 23-42) which had obtained the agreement of the Preparatory Committee was an improvement upon that contained in the Conference document. The representative of

the Secretary-General of the Conference stated that the remarks of the representative would be conveyed to the Conference.

74. The Committee was of the view that the specific recommendations flowing from the considerations outlined above could only be tentative at that stage and that concrete recommendations could be finalized only by the Conference. It was suggested that Governments might wish to consult further in the intervening period.

75. The Secretary-General of the Conference informed the Committee that, without prejudice to any consultations which Governments might wish to conduct in New York or elsewhere, he would make himself available in Geneva on 3 and 4 May 1972 for consultations on the institutional and funding questions with all interested Governments eligible to participate in the Conference. He hoped that that would facilitate consultations among those Governments.

76. Statements were made, at the invitation of the Chairman and with the approval of the Preparatory Committee, by the Chairman of the Intergovernmental Oceanographic Commission and by the representative of the International Council of Scientific Unions.

A/CONF. 48/12

# United Nations
# Conference on the human environment

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# The UN system
# and the human environment

consolidated document submitted by the ACC

only one earth

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Stockholm, 5 - 16 June 1972
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# Consolidated document
# on the
# UNITED NATIONS SYSTEM AND THE HUMAN ENVIRONMENT
# submitted by the
# Administrative Committee on Co-ordination

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1/ Available in Conference library.

## PREAMBLE

Environmental questions and how to deal with them within the United Nations system have concerned the Administrative Committee on Co-ordination (ACC) for some time, and at the 47th session of the Economic and Social Council (ECOSOC) when the idea of the United Nations Conference on the Human Environment was being considered, the ACC in a statement circulated to the Council[1/] suggested certain guidelines and principles. Emphasis was placed on the urgency and complexity of environmental questions and attention was drawn to the knowledge and experience of such questions already available in the system. In its initial statement the ACC referred to the variety and extent of problems of the human environment, some of which had global impact, noting that these demanded "intergovernmental co-operation for their solution" and necessarily would constitute "a major area for action by the United Nations organizations".

The same statement drew attention to the need for United Nations organizations to "adopt as far as possible an ecological and integrated approach in their activities relating to utilization of resources and environmental management", and to "promote preventive action and effective application of existing knowledge in dealing with environmental problems" whilst encouraging further research where necessary. Finally, ACC expressed its belief that the "complexity and magnitude of the problems of the human environment and their interdisciplinary nature call for even more effective inter-agency co-operation within the United Nations System".

Thereafter many of the organizations of the system were extensively involved in preparations for the 1972 Conference, some of them having assumed responsibility for preparation of basic papers. The intergovernmental arrangements for the Conference have been paralleled by inter-secretariat arrangements to assure that all necessary resources of the system are brought to bear in an orderly manner.

In its report to the forty-ninth session of the Council[2/] the ACC again drew attention to the principles and guidelines it had suggested in 1969. It welcomed the view of the Preparatory Committee of the Conference that "the Conference should make full use of work already going on or planned in the various international organizations

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[1/] see document E/4710

[2/] see document E/4840

concerned, and that the preparations should, inter alia, be designed to give the organizations "additional support, fresh impetus, a common outlook and direction". ACC shared the hope of the Preparatory Committee "that full consideration will be given to the environmental problems of the developing countries", and reaffirmed the willingness of the organizations of the system "to make available to the Conference knowledge about such problems derived from technical co-operation projects undertaken in various developing countries".

The ACC reported to the ECOSOC at its fifty-first session[1/] on the state of its preparations for the Conference, indicating that, on the basis of discussions with the Secretary-General of the Conference, it had been agreed that a consolidated document on the activities of the United Nations system of organizations in relation to the human environment would be presented by the ACC directly to the Conference in order to complement the official Conference documentation.

Hence an effort has been made in this document to present in a consolidated form an overview of the activities currently in progress, and of the technical resources available within the system which can be utilized in the implementation of such programme activities as may be proposed by the Conference and agreed by the competent organs of the organizations in the United Nations system. It is significant that the process of preparation in itself, which has taken place under the auspices of the ACC Functional Group on the Human Environment, with the World Meteorological Organization (WMO) acting as the responsible agency, has required an extensive internal reappraisal within the organizations concerned of their own resources and relevant programme undertakings. The pre-Conference period has thus served to stimulate the readiness of the organizations of the system to carry their appropriate responsibilities in a concerted manner, in the period of activity after the Conference itself.

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[1/] see document E/5012

# INTRODUCTION

1. When the United Nations and most of the specialized agencies were created some twenty-five years ago, the world was just emerging from the most widespread and devastating war which had ever scarred this planet. The time was for reconstruction, development and peace. The main economic and social problems were building and housing, increase in food production, stimulation of industry, supply of water and sanitation. Many aspects of these problems would today be called problems of the human environment, in the sense of the Stockholm Conference. These words, however, were not used and the stress in these early international efforts was more on quantity and economic growth. Yet, while progress was taking place a shift in priorities appeared, and more emphasis was placed on development of natural resources and on quality and social welfare. It is a fact that the UN system of organizations has been dealing in a rapidly expanding way with a large set of problems of the human environment.

2. Broadly speaking, the UN organizations have been created on the traditional sectoral pattern which had been developed, and still prevails, in most national governments, where one finds ministries for agriculture, for health, for labour, for education, for public works and so on. Within its own area of responsibility each UN body has therefore been led to develop activities relating to the human environment as far as its particular sector was concerned.

3. Each organization had to do this because many problems of the human environment have an international dimension, either because of their geographic scope (i.e. the pollution of the oceans), or because of their ubiquity (i.e. the planning of urban areas) or because of their cumulative effects and significance to the whole of mankind (i.e. the rational development and use of natural resources). In fact, the constitution of several UN organizations makes specific reference to their responsibility in certain environmental problems.

4. It should be recognized that, even today, this "sectoral" approach remains adequate to deal with a number of these problems, both nationally and internationally, as it can also provide the flexibility required to combine on an ad hoc basis, these sectoral activities according to different natural conditions and to changing socio-economic requirements.

5. At the same time it has become increasingly clear that many problems of the human environment are of an intersectoral nature, and, in fact, have often been the result of taking too narrow a sectoral approach. This situation has been recognized in the UN system for several years and has led to a number of efforts toward greater co-ordination of activities, for instance in relation to UNDP supported projects in developing countries. A definite, though relatively recent, trend towards interdisciplinary approaches has taken place in such fields as water resource development, population problems and environmental research. Moreover in the UN regional Commissions, and in the Economic Commission for Europe in particular, both a sectoral and intersectoral or horizontal approach to environmental problems is being followed.

6. Fundamentally, however, the UN system has retained its sectoral structure and approach to major areas and problems of human activity - a structure which might be called a "vertical" one. When one considers the totality of the very broad and complex problems of the human environment, as the Stockholm Conference proposes to do, a horizontal "cut" across all areas of human activity has to be made which necessarily transcends the activities of the whole UN system.

7. It becomes obvious that all UN organizations have some kind of interest or involvement in some aspect of this total subject. This appears quite reasonable, indeed it would be surprising if each organization was not interested and involved in a particular aspect of it.

8. The UN system as it exists now has therefore a broad experience and a constitutional concern for most problems of the human environment. It provides a major basis for any additional activities which the Members States, in the light of the present world situation, may wish to establish.

9. As environmental control is to a large extent an administrative and managerial problem, the Administrative Committee on Co-ordination felt it would be useful for the UN Conference on the Human Environment to have before it consolidated information on both the ongoing and planned activities in this field within the system. It considered that this would be particularly helpful to the Conference in considering the question of the international organizational implications of action proposals.

10. Chapter I of this report outlines briefly the current activities of the UN system of organizations in relation to the environment and as defined by the respective governing bodies of these organizations. This information is arranged according to the main agenda items of the Conference. The chapter also gives some examples of the trend toward multidisciplinary approaches within the UN system. Chapter II describes the functions to be performed by the UN system in relation to national and international aspects of the problems of the human environment and attempts to analyse these functions in a prospective way, related to activities and programmes which are already planned. Some final remarks are given in Chapter III.

11. In order to give a general picture of how the organizations see their involvement with the problems of the human environment in relation to their terms of reference, short summarizing notes presented by each organization on this subject are listed in Annex I. A detailed but, of course, not exhaustive presentation of the activities of the organizations or units of the UN system is presented in Annex II[1] in accordance with the proposed agenda for the Conference, as agreed upon by the second session of the Preparatory Committee for the Conference in February 1971. Whilst there is inevitably some duplication as between chapters and annex of the report, the self-contained nature of each part will facilitate its use as a reference document by Member governments and the UN Conference secretariat, especially when analysing the bearing of any particular action proposal on UN institutions.

12. It is hoped that this report will help to reveal possible gaps in the treatment of certain problems and also indicate possibilities for further co-ordination of efforts within the system as well as with organizations outside the UN system. If environmental management and control is to be effective, there will need to be an unbroken chain of action at local, national, regional and global levels. To this end, this document is an attempt to provide a full appreciation of the potentialities offered by the UN system for broadened world-wide efforts toward a better human environment.

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1/ Available in the Conference library.

## Chapter I

## CURRENT ACTIVITIES OF THE UNITED NATIONS SYSTEM

### A. The planning and management of human settlements for environmental quality

13. Among the most serious environmental problems which the rapidly growing population of the world is facing are those related to human settlements.

14. The problems arise from population growth, from population distribution within urban and rural zones, and from complex human activities associated with social and economic progress. The overwhelming majority of these activities are concentrated within the physical framework of human settlements, and therefore the main conflicts between human activities, natural qualities of the environment and human biological needs arise exactly there.

15. Extensive and continuous interplay of physical aspects of the environment of human settlements with the economic activities and social behaviour of its inhabitants caused many of the United Nations family of organizations to become involved with the environmental aspects of settlements and settlements networks development.

16. Of the matters of concern dealt with by the United Nations system under this item, the Department of Economic and Social Affairs is deeply involved in population problems, as well as such planning and management questions related to the human settlements as land-use policies, transport development, economics of urbanization, housing and building problems, and redevelopment of slums.

17. The Department has also directed a substantial part of its activities towards the basic issues related to the environment of human settlements. Various specialized divisions are collecting and processing data, initiating research, developing exchange of experiences and disseminating knowledge. Last but not least they are expanding technical co-operation programmes in such crucial aspects of environmental development as policies in population growth and distribution, processes of urbanization and of modernization of rural settlements, administrative and legal aspects of settlements evolution and growth. A great deal of attention is also given to the social aspects of the above processes.

18. The aspects of planning of housing and building for environmental development have been for a long time issues of major importance handled by the Department particularly in the Centre for Housing, Building and Planning.

19. The environmental planning for settlements development aims at expressing the complex social and economic goals of development in physical terms and environmental qualities of a settlement, or of a system of settlements, which will be related to the regional or national scale.

20. Housing, together with its related facilities and services, involves those components of all settlements which are most directly related to living standards, to human health and to social satisfaction. Finally, the building industry and technology is an important physical tool in settlements development, and progress and improvement of settlements, in terms of both quantity and quality, depend extensively upon the efficiency of that tool.

21. The extensive involvement of the United Nations in settlements development is related to research such issues as the economics of urbanization, urban land tenure and land-use policies. It is also related to advising on preventive and remedial measures in planning for the development of tourism, or promoting pilot projects in improvement and redevelopment of slums and transitional settlements. Operational activities and studies include also, assessment of transport problems in the context of physical environment and human activities, and the implications for the environment of transport measures for specific sectors of the economy. Investigations in connexion with implementation of projects often include ecological considerations. Various transport alternatives are considered before recommending a solution. In carrying out these functions, the United Nations co-operates with various non-governmental organizations and academic institutions.

22. In addition, the Economic Commission for Europe has a comprehensive and long-term research and study programme which is institutionalized through formal intergovernmental machinery to deal with human settlement problems such as regional and urban development, the provision of housing and community facilities, land-use policies, urban and sub-urban transport, urban renewal, water resources management, air pollution, etc.

23. The industrial component in the planning of human settlements and environmental problems of industrial origin also deserves special attention. In this context, the United Nations Industrial Development Organization (UNIDO) provides advice and assistance regarding the appropriate location and siting of industrial plants, and has been giving attention to various means of abating the effects of pollution, including improvements in waste-disposal systems.

24. In the past, assistance from the United Nations Children's Fund (UNICEF) has been devoted mainly to children in rural areas. While such assistance will continue to be the most important part of UNICEF's work with developing countries, in view of rapid urban growth, UNICEF has recently adopted new guidelines for assisting programmes for the well-being of children and adolescents in slums and shanty-towns. In co-operation with other agencies of the United Nations, a special effort is made to take an overall view of the human, social and physical developmental aspects of slums and shanty-towns.

25. In addition to the above activities of United Nations bodies several specialized United Nations agencies deal with the planning and management of human settlements development, with pre-investment and technical assistance offered by the United Nations Development Programme.

26. The World Health Organization (WHO), for example, in order to promote human health and welfare, aims at the prevention and control of transmission of infectious agents, freedom from chemical and physical hazards and stress, as well as at the promotion of physical and social well-being through appropriate measures in the planning of human settlements. It has taken significant action in recommending environmental health criteria in this planning process and for housing; in promoting the planning and control of public water supplies, waste disposal and the control of environmental pollution associated with human settlements and in the formulation of international standards of water quality as well as the development of methods of eliminating noxious substances from water. Studies have been completed on urban industrial effects on health and on epidemiological and public health factors in housing and town planning, including the aspect of occupational health. WHO is particularly interested in the assessment and control of urban air pollution. An International Advisory Committee on Environmental Carcinogenesis has been established by the International Agency for Research on Cancer (IARC) to provide governments with advice on the potential carcinogenic effect of chemical compounds in the environment. Approximately 60 compounds are reviewed each year. The IARC is also using its Regional Centres as key areas for co-operative studies between industrial and non-industrial environments relative to cancer in man.

27. The International Labour Organisation (ILO) is traditionally concerned with the siting of workers' housing, house design, the provision of utilities and amenities as well as social services. Of particular concern are the physical conditions of the work place. The safety, health and well-being of workers, whether in factories,

mines, fields or offices, are primary subjects for action. Other aspects relevant to the workers' environment are also covered - job satisfaction, the fitting of work to the human being, housing, recreation facilities and the use of leisure.

28. The Food and Agriculture Organization (FAO) has a large responsibility in formulating guidelines for the settlement and resettlement of rural population. Under its programme for agrarian reform and integrated rural development, FAO has various projects dealing with measures to improve living standards and to ensure full employment of the rural population. The World Food Programme is significantly active in support of infrastructural and community development works both rural and urban.

29. The World Meteorological Organization (WMO) promotes the application of meteorology to planning for environmental development of settlements, pointing out that the process of urbanization gives rise to local modifications in weather and climate. In planning urban areas climatological information and knowledge may be applied, for instance, in the siting of industrial areas, the appropriate spatial distribution of green and open spaces as well as in the design of buildings to ensure satisfactory thermal and comfort conditions.

30. The varied activities of the United Nations Educational, Scientific and Cultural Organization (UNESCO) relate not only to the scientific aspects of the environment, but also to the social, cultural and aesthetic factors of the environment and their behavioural implications. Concerning the latter, UNESCO is currently undertaking an interdisciplinary project (i.e. Man and his Environment - Design for Living), which focuses on the micro-environment and on the creation of favourable social relationships in a genuinely human environment. Furthermore, UNESCO is continuing studies and actions related to the cultural preservation of cities, monuments, sites and other artistic and historical heritage which has led to the preparation of a Convention and recommendation on the protection of monuments and sites of universal value.

31. The work of the agencies of the United Nations system would be severely handicapped without the co-operation of the regional economic commissions. Many of the studies and surveys which form part of major programmes are supported, or

complemented, by work carried out on a regional level by the Economic Commissions for Africa, Asia and the Far East, Europe, Latin America and by the Economic and Social Office at Beirut. The Economic Commission for Europe, for example, has permanent intergovernmental bodies for carrying out a research and study programme and promoting international co-operation on: water management problems, including water pollution; housing, building and physical planning; air pollution; a series of industrial sectors; and most recently a new body of senior environmental advisors to governments.

52. Moreover, the United Nations Development Programme (UNDP), providing pre-investment and technical assistance to those countries needing and requesting such aid, has approved so far more than twenty projects for improving water supply, sewage disposal and pollution prevention, which have been carried out in co-operation with the appropriate United Nations organizations. Numerous other UNDP projects are concerned with helping Governments in systematic urban planning and in some cases rehabilitation. One of the major problems in overcrowded cities is the uncontrolled urban sprawl; UNDP support has attempted, particularly in many low-income countries, to provide a greater measure of control of this problem.

## B. The environmental aspects of natural resources management

33. When natural resources are exploited, there is an inevitable effect on the environment because the resources are used up or degraded, and because the balance between different resources is disturbed. While these effects are not always detrimental, in all too many cases they have given rise to difficult problems.

34. Since in certain instances one country's use of its natural resources (or common natural resources as, for instance, fisheries) can affect the economy and the environment of another, the countries have seen the need to develop a global framework for joint planning and management of natural resources. As a consequence, this has become a major function of organizations of the United Nations system. The requirements for such a framework include basic studies and research on these resources (see further UNESCO, WMO), specific inventories and surveys of the uses of natural resources (see further the United Nations and FAO), and the development of guidelines for planning and managing these resources in each sector of the activities of the United Nations system. Moreover, as governments of developing countries have made requests to the United Nations system to assist them in formulating and in implementing the countries' development plans, many United Nations bodies and agencies have become more directly involved in the management of natural resources.

35. As explained in the introduction, the distribution of the tasks among international institutions follows, in the main, the pattern followed in national institutions. FAO is the main United Nations agency dealing with the management of natural resources for agriculture, forestry and fisheries. In these sectors, the need for sustained long-term productivity requires that environmental considerations be incorporated into comprehensive planning and management of crop lands, livestock and grazing lands, forests, water resources for agriculture, fisheries, wild life, national parks and other natural resources used for recreation:

(a) At the planning stage, a proper assessment of the potentialities and limitations of the use of these resources is required, to ensure that future use will not lead to their deterioration or depletion. To this end, FAO is engaged in several natural resources assessment programmes. At global levels this is often carried out co-operatively, as in the case of the soil map of the world, which is being produced jointly with

UNESCO. At national and local levels, these inventories are part of development feasibility studies, and projects are carried out with the support of UNDP at the request of and together with governments. Survey information is collected and processed by FAO in order to outline global development plans, such as the Indicative World Plan for Agricultural Development;

(b) At the management level the promotion of sound management and conservation methods and practices in agriculture, forestry and fisheries is one of the major tasks of FAO. In the main, this is achieved with the support of UNDP through field programmes and projects of applied research, experimentation, demonstration and extension work aiming at better use and adaptation of new technology to local conditions, local ecological conditions in particular. Other contributions are made by programmes of assistance to governments in developing adequate legislation, administration and institutions for the conservation of their resources. Moreover, FAO has for many years also been responsible for activities in the field of conservation in a more narrow sense, such as soil erosion control, water resources conservation, protection of genetic resources, protection of crops, livestocks, forests and fishes against pests and diseases, wild life management, forest conservation.

36. Several projects related to natural resources management in developing countries have received support from the World Food Programme under which food assistance is provided largely as part-payment of wages for labour, engaged, for example, in various forms of afforestation, erosion control, flood control, drought control and watershed management.

37. Natural resources management, including its environmental aspects, is one of the major areas of concern also of the United Nations and includes by far the largest part of its field operations. Here the emphasis is placed on water resources, mineral resources and energy resources. In its studies of the environmental aspects of the use of various types of resources, the United Nations has pointed out that there often exist alternative possibilities, particularly in the field of energy where there are a number of resources available to produce energy which are far less damaging to the environment than, say, burning fossil fuels. As regards mineral production,

attention is drawn to the desirability of not only extracting and exporting raw minerals from developing countries but also, where practicable, processing them in the producer countries. Moreover, it is necessary to bear in mind the self-cleaning capacity of the water and air used in industrial and other activities, and that only where this self-cleaning capacity has been reached or exceeded will it be necessary to introduce technological means to reduce or to prevent further water and air pollution.

38. The substantive activities in the United Nations dealing with the environmental aspects of natural resources management are primarily carried out by the Resources and Transport Division, notably with regard to non-agricultural resources and uses, and on a regional basis through the Regional Economic Commissions. They are guided by the standing Committee on Natural Resources at the global level and corresponding intergovernmental bodies in several of the regions. Thus, in the Economic Commission for Europe there are permanent intergovernmental bodies dealing with coal, gas, agricultural land, forests and water, including hydropower, all of whom give considerable attention to environmental problems in their sectors. In the area of comprehensive water management, policy recommendations are further made to Governments, in particular as regards the pollution and depletion of water resources. The IAEA has primary responsibility in the exploration of radioactive minerals as well as in assisting Governments in the exploitation of such resources. All these bodies carry out research and study and organize seminars, expert working parties, study tours.

39. The activities of the Resources and Transport Division are essentially directed towards meeting the needs and challenges of developing countries, with an increasing emphasis on environmental aspects, in such areas as overall management of water resources, energy resources and electrification, mineral resources, including those of the oceans and their pollution, and basic mapping and surveying. This includes exploring new resources, stimulating new technology, strengthening administrative and technical services in governments, organizing applied technical and economic research, seminars, conferences and publications.

40. The Advisory Committee on the Application of Science and Technology to Development has provided developing countries with policy guidelines for the investigation, development and rational utilization of their natural resources on the basis of an integrated approach to the subject, taking into account the accumulated experience of the United Nations system as a whole.

41. Knowledge of weather and climate is crucial to the use of natural resources. Through atmospheric and surface-water monitoring systems and Technical Commissions, WMO often, in co-operation with UNDP, provides means and advice to governments in applying meteorological forecasting and climatological information to the efficient use of land for agriculture and forestry as well as to the development of other natural resources. Several special projects in this area are also carried out in co-operation with FAO, UNESCO and UNDP in the Inter-agency Group on Agricultural Biometeorology.

42. A major intergovernmental enterprise operated by UNESCO and implemented in co-operation with the United Nations, FAO and WMO, is the International Hydrological Decade, which created for the first time a suitable framework for a world-wide concerted action aimed at intensifying research in all branches of hydrology and improving the training of hydrologists so that each country, and hence the international community, could better evaluate and exploit its water resources. Its purpose is to encourage the international community to evaluate the potential of its water resources and utilize them with a minimum of damage. This is being carried out by promoting, in co-operation with WMO, the establishment of basic networks to observe and measure various elements of the water cycle, and by studying the structure of the cycle in basins situated in well-defined topographical and climatic areas. As a result of this research, UNESCO is developing a general inventory of superficial and groundwater resources to evaluate the modification of the water cycle by human activities. There are many examples of how the misuse of natural resources has already led to a rapid and sometimes irreversible deterioration. The extent of environmental deterioration and its effect upon the biosphere has recently become the subject of a long-term programme of an interdisciplinary character launched and co-ordinated under the auspices of UNESCO. This programme, the Man and the Biosphere Programme (MAB), seeks the support of all governments for co-operative research projects, for the training of specialists, and for the building up of observation, research and training institutions. Its main objective is to develop a scientific basis for the rational use and conservation of the resources of the biosphere, and for improving the global relationship between man and the environment. Although various aspects of the MAB have still to be elaborated, it is likely that the following activities will be carried out:

(a) Research on the structure and functioning of the biosphere and its ecosystems;

(b) Assessment of the extent to which the biosphere and the ecosystems can be modified by man without deterioration of its functional structure;

(c) Study of the effects on human populations of man-made changes in the environment; and

(d) Related education and training.

43. As part of its marine sciences programme, UNESCO in co-operation with agencies such as FAO, IMCO, WHO and WMO, supports the work of the Intergovernmental Oceanographic Commission in encouraging a rational use of the oceans. The Commission promotes and facilitates scientific investigations in order to learn more about the nature and resources of the oceans. Some of its activities include international co-operative expeditions such as the International Indian Ocean Expedition, with subsequent analysis and publishing of results.

44. In this connexion, it should be mentioned that the United Nations is considering the establishment of an international regime to safeguard the use of the sea bed. For this purpose a special intergovernmental committee is proposed; the principles on which the regime would be based include prevention of contamination of the oceans and the protection of marine resources.

## C. Identification and control of pollutants of broad international significance

45. In the nineteen fifties the world first awoke to the truly global consequences of the polluting activities of individual nations as a result of the radioactive fall-out from nuclear bomb tests in the atmosphere, when a significantly increased level of Strontium 90 was registered in such homely essentials as milk and vegetables in areas of the world remote from the scene of any such tests.

46. In order to act as a focal point for all data and information coming from Members and from certain other organizations in the United Nations family on this little-known new threat to mankind, the United Nations set up in 1955 the Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), and it was partly as a result of the findings of this committee on the observed level of radioactive contamination and its actual and probable effects that an agreement was reached between the then major "Nuclear Powers" banning further tests in the atmosphere. The Committee continues to act as watch-dog in respect of ionizing radiation and radioactivity in the environment.

47. The IAEA, established about a year after UNSCEAR, is responsible for all aspects of the peaceful use of nuclear energy, bringing the great benefits afforded by such techniques to countries all over the world and at the same time ensuring the safety of workers in nuclear plants and the protection of the environment in general from the potentially dangerous materials handled. The global trend of radioactivity in the atmosphere is also studied by IAEA in co-operation with WMO through a global network of stations measuring isotopes content in precipitation.

48. Activities in the field of nuclear physics were chosen to introduce this item on environmental pollutants because, for one thing, such pollution can be transported in all three elements of the environment - atmosphere, hydrosphere and lithosphere - but also because it shows how effective action has already been taken by nations, through international forums, in responding to the grave threat to the environment posed by the uncontrolled use of radioactive materials. The measures taken have been so effective that if the problems involved with the disposal of work are disregarded nuclear reactors are now justifiably considered as "clean" generators of energy.

49. Advances in the application of nuclear energy and nuclear techniques are useful in the management of environmental resources. The International Atomic Energy Agency (IAEA) is promoting the use of isotope techniques in hydrological investigations and, indeed, is collaborating with a number of other organizations in providing this kind

of expertise on a sub-contractual basis for UNDP projects. The IAEA, jointly with FAO, also promotes the use of nuclear techniques (radiation and isotope tracers) in agriculture for studying the fate of environmental chemical (pesticides) and radioactive contaminants, in development of non-chemical insect control (sterile male technique) and food preservation (irradiation) methods, in improvement of crop varieties (radiation induced mutants), as well as in increase of efficiency of use of fertilizer and water and in improvement of animal husbandry practices.

50. In the following paragraphs of this chapter other forms of environmental pollution will be considered under the headings of the media in which they are normally present, namely the air, water and land. The presentation varies from that of the agenda of the Stockholm Conference in that it includes for each medium the identification, assessment and control of pollution.

51. Before entering into the discussion on activities of the United Nations system in relation to pollution in the various media, some general statements regarding the involvements of various agencies should help to clarify the picture. By virtue of its convention, WMO is the agency taking special responsibilities for following trends and changes in the atmospheric environment. These responsibilities are shared with WHO, which organization has the responsibility for health aspects of atmospheric pollution. WHO has similar duties in relation to pollution of the sea, inland waters and soils as well as for contamination of the food chain. Marine pollution is a field where several other agencies are involved, such as above all IMCO and UNESCO (through IOC), but also FAO in view of its responsibilities for the world fisheries, WMO because of the close interaction between the ocean and the atmosphere and the United Nations in view of its interest in the exploitation aspects of the sea. Pollution of inland waters is mainly a concern of UNESCO, WMO and the United Nations considering respectively the scientific, operational and exploitation aspects. Pollution of soils and contamination of the food chain are problems of obvious concern to FAO, while general scientific and research aspects are dealt with by UNESCO. The control aspects of pollution, in addition to what is done by the agencies mentioned above, is a great concern of, for instance, the Economic Commission for Europe.

52. In addition UNITAR carries out policy-oriented research concerned with the design both of remedial action for specific problems and of overall strategic approaches to pollution problems of international significance.

(i) Pollution of the atmosphere

53. Air pollution of the type formed by the combinations of sulphur-containing fuels became a severe problem in several developed countries following the industrial revolution, and further technological developments, particularly the automobile, have added to the range of noxious substances contained in the air around large cities and regions of heavy industry.

54. In relation to such local problems of air pollution in fairly high concentration, work is being carried out by WHO to identify and assess, through continuous monitoring in a network of cities, the levels and trends of specific air pollutants, as well as their effect on the health of people, especially on the respiratory system. On this basis environmental health criteria and guidelines are formulated by WHO to aid governments in the establishment of environmental health standards for air. Particular attention is given in this respect by both WHO and ILO to the working environment in which the working man spends most of his life. ILO has carried out studies relating to the quality of air in industrial establishments and the prevention and suppression of airborne dust in mining, tunnelling and quarrying, and has established international classification of radiographs of the pneumoconioses. Assessment of high concentration air pollution and its effect on air quality standards are greatly influenced by meteorological factors and hence WMO makes an important contribution in this field by promoting the development of methods for investigating dispersion and transformation of pollution in cities and industrial areas as well as at longer distances. In this connexion, WMO is also promoting climatological studies of air pollution potential in connexion with the siting of new industries and new towns.

55. Whilst the most severe effects of air pollution are felt in the vicinity of the emitting sources, concern has been expressed as to the effect upon climate of the increased global amount of pollution, especially carbon dioxide and particulate matter, present in the atmosphere. Accordingly, WMO is sponsoring the establishment of a network of stations to measure the background air pollution as a necessary first step in the study of this problem. In addition, it promotes research on effects on regional and global climates of atmospheric pollution and changes in the composition of the atmosphere.

56. Measures to reduce air pollution are mostly the responsibility of the United Nations. The Economic Commission for Europe has undertaken considerable work on the reduction of sulphur oxides from the emissions of power and heat installations. It

has also studied the elimination of fly-ash from coking operations and the reduction of sulphur oxides, dust, carbon monoxide, etc. from the smoke of iron and steel plants. The control of emissions of such pollutants as fluorides, arsenic, sulphur oxides, metal oxides and dust from the non-ferrous metallurgical industries and of a large variety of pollutants arising from the chemical industries are being studied by the ECE. These methods are advocated by the Research and Transport Division of the United Nations, which also advises on alternative "clean" operations. UNIDO is active in controlling pollution at source within the industrial sector and, with this in view, in providing assistance in assessing the extent of industrial pollution and advising on ways and and means of reducing industrial pollution and nuisances. This refers not only to air pollution but also to pollution of waters.

57. A number of recently approved UNDP projects are assisting authorities in developing countries such as Chile, Brazil, Poland, Romania and Czechoslovakia to monitor and control the problem of air pollution.

(ii) Pollution of the sea and inland waters

58. Among contaminations of the sea the disposal of waste products in rivers and coastal waters gives rise to the most considerable problems and the pollution added from the atmosphere is also significant. Furthermore, as a result of the rising number of incidents involving tankers and other maritime traffic, oil, either deliberately or accidentally discharged has become an important source of pollution of the oceans and coastal water causing concern both from the point of view of marine life and on account of the fouling of beaches.

59. A joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP) in which seven United Nations organizations - IMCO, FAO, UNESCO, WMO, WHO, IAEA and the United Nations - participate is dedicated to a thorough study of the problem of marine pollution from a scientific viewpoint. This includes studying the relation between atmospheric and ocean pollution, analysing the potentially toxic substances in the sea and determining how they got there, studying their effects on marine organisms and on humans and considering scientific and technical aspects of pollution control. A substantial contribution to the work of this group is being made by IAEA at the International Laboratory on Marine Radioactivity at Monaco.

60. The Intergovernmental Oceanographic Commission (IOC) is organizing the Global Investigation of Pollution in the Marine Environment in which various organizations and bodies interested in oceanographic programmes would participate. It is expected

that the Integrated Global Ocean Station System (IGOSS) which is being developed by IOC with the support of the WMO monitoring systems in order to provide real-time oceanographic and meteorological data might become a basic monitoring component in this investigation.

61. Individually, too, the organizations are engaged in various activities to combat marine pollution. The Intergovernmental Maritime Consultative Organization (IMCO), at grips with the problem of oil pollution, has brought about several international conventions relating to the discharge by ships of oil and other noxious substances into the sea, and work is going ahead on preparations for further international legislation in this field, with the aim of eliminating all such deliberate discharging and minimizing accidental spillages by the end of the present decade and for providing compensation for the victims of pollution. FAO is studying the effects of oil and other forms of pollution with respect to the productivity of the aquatic environment and in particular to the fisheries of the world; UNESCO supports zoo-plankton and other biological studies within the framework of research into the functioning of marine life and the changes taking place therein. WMO is studying the movement of oil spills under the combined effect of wind and currents.

62. UNESCO is also engaged in studies to assess the effects of mankind's activities on the normal ecology of aquatic organisms through its Man and the Biosphere programme, and, as part of its International Hydrological Decade programme, efforts are being made to promote the establishment of pollution monitoring systems for inland waters.

63. WHO is undertaking work to pinpoint problems of specific pollutants in water bodies which affect public water supplies and which are dangerous to man seeking recreation on or in the water, or which can reach him through the food chain. Research is also under way to study methods for removing deleterious substances from water and to formulate environmental health criteria for surface waters as a basis for the establishment by governments of water quality standards. Already twenty UNDP assisted projects are aimed at helping developing countries preserve the purity of their water supplies and safely dispose of sewage. Two UNDP/WMO projects are directly aimed at reducing water pollution in Romania and Poland.

64. Measures to reduce water pollution consist of either finding an alternative process to that which produces the pollution, or in treating the water after use to extract harmful substances at least to a level at which the self-cleaning capacity of the water is effective. As regards thermal effluents, there are various means by

which the excess heat could be utilized which in some cases could make the overall economics of a project more attractive. The United Nations and its branches are advising on such measures to safeguard deposits of fresh water from pollution, and FAO maintains a programme aimed at reducing any excessive or uncontrolled uses of fertilizers and pesticides.

65. The United Nations Economic Commission for Europe is studying problems of inland water pollution from domestic and various industrial sources such as the pulp and paper, chemical, textile, iron and steel, coal, thermal power and oil refining industries. Attention has also been given to pollution by detergents, and the study of pollution caused by agriculture and forestry including the use of pesticides and fertilizers is receiving high priority.

(iii) Pollution of the land

66. It has already been pointed out that rain or other forms of precipitation falling through polluted air will take into solution some of the toxic substances. The same holds true to an even greater extent as the rainwater leaches through polluted soil before replenishing the rivers, lakes or reservoirs from which man draws his fresh water supply. Therefore to ensure greater purity of water supplies it is essential to take precautions to protect the soil and all things on it from any source of pollution. Such measures are therefore a component of the activities outlined in the preceding sub-item on pollution of fresh water supplies.

67. The environmental problem of land pollution can be exemplified by open-cast mining activities which upset the natural drainage system as well as vegetation covering good agricultural land. The Resources and Transport Division of the United Nations is promoting the inclusion of environmental considerations in all such projects. WHO maintains surveillance also on soil contamination through its Reference Centres and a network of collaborating institutions.

68. As mentioned earlier, FAO is greatly involved in avoiding degradation of soil through ill-considered actions of man. The control of application of biocides and other agrochemicals, already referred to under water pollution as a concern of FAO, is no less relevant in the context of soil pollution.

69. The effects of pollution on vegetation and livestock have been studied by FAO and WMO. FAO is currently working on various problems to agriculture and food of waste disposal and contaminants, including their legal aspects. Numerous UNDP financed projects are already assisting developing countries to tackle the problem of food

contamination. To ensure that food products reach the consumer without being significantly contaminated by additives, pesticides, etc., the FAO and the WHO have jointly established the Codex Alimentarious Commission whose task it is to draw up food standards at an international level.

(iv) Noise

70. The problem of noise is also receiving some attention. ICAO is doing research on the effects of aircraft noise and the degree to which the population is affected; this applies to both the noise in the vicinity of airports and to the sonic boom of future commercial supersonic air transport. "An annex (No. 16) to the Convention on International Civil Aviation has recently been developed and published by ICAO. It contains international standards and recommended practices related to: aircraft noise certification, noise measurement and noise abatement operating procedures." Agreements as regards acceptable noise limits from road and inland waterway traffic have been drawn up by the United Nations Economic Commission for Europe, which also controls radio interference from motor vehicles.

## D. Educational, informational, social and cultural aspects of environmental issues

71. The importance of educating experts and informing the public on environmental issues cannot be over-emphasized. It is only by getting across to the public the facts related to the problems created by wholesale destruction, exploitation and pollution of elements of the natural environment, that we can hope to solve the problem of the human environment.

72. The United Nations system can be a very useful mechanism for carrying out such a programme of enlightenment, both in training experts and informing the layman. All United Nations agencies are engaged in some form of educational activity within their respective fields, and already a considerable number have included environmental aspects within their programmes. However, in view of the relatively recent development of an integrated concept of the human environment, comparatively few attempts have yet been made to develop courses and training programmes of a multidisciplinary nature with increased emphasis on the environment.

73. UNESCO, in view of its responsibilities, is the primary agency which has taken steps in this direction. An important part of UNESCO's activities are in support of post-graduate courses given in universities around the world, especially courses relating to the natural sciences. Particular emphasis is being put on the training of specialists in environmental sciences and in ecological and integrated natural resources studies. The integration of environmental aspects into existing courses is another approach and ecological principles are progressively introduced in the training activities of UNESCO relating not only to hydrology and oceanography but also to engineering and architecture.

74. It is interesting to note that education, at the primary and secondary level, is becoming oriented more towards the environment, and UNESCO is encouraging this trend. It was recognized long ago, particularly by FAO, that, to be beneficial, appreciation and understanding of nature should be taught and that for a sustained long-term food and agricultural development, extension work and training regarding adoption of new technologies to local conditions are essential.

75. The education of the working man to improve his working conditions is a major aim of the ILO. Classical topics of the worker's education include collective bargaining for better working and living conditions, self-discipline with respect to safety and health and a number of measures aimed at improving the quality of his life

(housing, recreation, social courses). Close contact is maintained with unions, labour colleges, universities and worker's associations throughout the world by producing educational material related directly or indirectly to the working and living environment.

76. In general, the specialized agencies include both education of experts and information for the general public as components of their programme aimed at improving the quality of the environment. This is accomplished through fellowships, special training courses, films, lectures, conferences, seminars, study tours, etc., by publishing reports and guidance material, and by providing equipment. Most of FAO's activities have, in addition, social objectives for the improvement of rural life. Studies of rural sociology and traditions are carried out in order to understand the viewpoints of local people before trying to induce them to accept and support necessary measures aimed at improving environment (see also Chapter II, Section 8).

77. One of the major efforts in the cultural field is the establishment, by UNESCO, of international instruments for the protection of cultural property. Missions are sent out and research is undertaken to examine and recommend treatment for the preservation of monuments and sites. In some cases international protection campaigns are organized. In these efforts, the trend is to combine the protection of historical and cultural remains with that of natural areas of scientific, aesthetic, and recreational interest. In this context a number of UNDP projects are helping developing countries to preserve relics of their past heritage and make them accessible to their peoples and to visitors.

78. An ECE Committee has done considerable work on the preservation of sites of historical or architectural value, especially under the pressure of urban renewal schemes. The ECE Symposium on Environmental Problems dealt to some extent with training in environmental disciplines; public education, information and participation.

79. With respect to environment-related training at the policy-making levels both within the United Nations itself and for national officials involved with international organizations, UNITAR intends to undertake special environment training activities and to incorporate environment-related material into its on-going training activities.

## E. Development and the environment

80. It cannot be over-emphasized that all programmes of development must be based on suitable and consistent policies which, *inter alia*, are designed to safeguard the environment in the implementation of the various projects. The programmes, moreover, must have clearly defined objectives and an unequivocal set of priorities.

81. The activities of the United Nations system of organizations are geared to development and it is a fact that virtually all the organizations are concerned with development programmes which have some bearing on the environment. Environmental considerations have in a number of cases been integrated into the operational and non-operational activities of these organizations, and reference to Annex II[1] will reveal several examples of development projects in which environmental protection measures are incorporated. The World Plan of Action prepared by the United Nations Advisory Committee on the Application of Science and Technology to Development with the assistance of specialized agencies and other United Nations bodies, as an adjunct to the strategy for the second Development Decade, is a prominent example which demonstrates this approach. However, much remains to be done, and the United Nations is adopting more and more the use of interdisciplinary teams of technical and economic personnel in framing and implementing development projects. Such an interdisciplinary approach has proved to be more effective in view of the increasing number of alternative technical solutions with differing economic implications which can be applied to individual projects.

82. The United Nations in its field operations is fully aware that the basic requirement of developing countries is economic and social development. On a long-term basis there is no inherent conflict between such development, provided it is properly planned, and the protection of the human environment. Even in the case of industrial development there are often enough options and technological possibilities to allow exploitation with minimal environmental damage. The development of local sources of energy is often of particular interest. A geothermal power station will, for instance, operate both "cleaner" and, at a lower cost than a conventional one, burning fuel, so that its application will imply benefit both from the economic and the environmental points of view.

83. As regards industry, employers' and workers' organizations have particular interest in questions relating to development and the environment. As partners in the productive process, they can make a major contribution to ensuring that development takes account of environmental considerations. Both national and international employers' and workers' organizations are fully associated with the work of the ILO.

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1/ Available in the Conference library.

84. An important factor in environmental considerations in planning development projects is the economic implications of carrying out the protective measures proposed. Feasibility studies are under way in many agencies to determine a methodology according to which cost/benefit studies could be made in an objective and meaningful way and where environmental protection aspects are included. UNIDO, for instance, is carrying out a study of the economics of environmental quality and its implication for the industrial sector which will focus on pollution as a distortion of the allocation of productive resources.

85. Environmental issues are going to exercise a growing influence on international economic relations. They are not only a competitor for development resources but they are also a factor which is going to influence the pattern of world trade, the international location of industries and the competitive position of different groups of countries. Environmental actions by developed countries are going to have a profound and manyfold impact on the growth and external economic relations of developing countries. UNCTAD is conducting studies which aim at investigating these processes with special reference to the possible growth of tariff and non-tariff barriers, to shifts in primary commodity markets, to the impact of re-cycling on trade and to new relationships between synthetic and natural products.

86. An essential element in modern development is transportation, and it is important that planners of transport systems take into account environmental considerations. Water transportation in certain forms is likely to increase in view of its minimal polluting characteristics, and in developing countries irrigation canals can be designed to allow barge traffic; also in the development of river basin areas the rivers can be used for transport purposes. In the conveyance of oil and certain chemicals the pipe-line offers a means of reducing costs and at the same time of reducing the risk of spillage. These are some of the ideas which are being promoted by the United Nations in its many development programmes.

87. Pollution control standards imposed by governments will almost inevitably affect the competitive position of individual industries engaged in international trade. To a great extent new cost differences, such as those arising from introduction of new or more stringent pollution control requirements, may be absorbed, especially where a period of time is provided for industrial adjustment, by the working of the market mechanism. Nevertheless, there will certainly be pressure from affected industries to persuade governments to protect them against increased competition, or assist in meeting the new costs, or both. The magnitude of these costs, their uneven

distribution, the basic character of some of the industries which will be among the hardest hit (steel and chemicals in particular), and the social aspects of the case for pollution control will all constitute powerful arguments for a sympathetic response. Yet many if not most of the measures which governments might take to cushion the competitive impact or to redistribute the costs, would be likely to affect the legitimate trade interests of foreign suppliers of the products in question and could, accordingly, have adverse repercussions on the country's own export trade.

88. GATT is an international agreement subscribed to by seventy-eight countries, the main aim of which is to ensure that maximum scope is safeguarded for the play of cost differences in, and thus for the expansion of international trade, consistent with the most efficient use of resources in maximizing real incomes and living standards. All possible governmental measures which might restrict the flow of trade are within GATT's purview and GATT rules generally tend to limit the grant of protection to domestic industry. Accordingly, GATT may be expected to play a role in studying the implications of various possible lines of national policy in regard to public assistance in industrial pollution control, with a view to avoiding ill-considered or premature use by individual governments of aids which might prove to be unnecessarily harmful to international trade. This is a role which is of importance also for the trade of developing countries, for whom pollution control standards in relation to the present needs for protection of environment might conceivably be different from those required by the highly industrialized countries.

89. In particular, the developing countries' participation in GATT (some fifty-odd developing countries are contracting parties) entitles them to specific rights with respect to their treatment by other GATT countries in trade policy matters. GATT will consequently also offer them an effective forum in which to seek relief from any adverse effects on their exports of measures adopted by industrialized countries for pollution control.

90. The ECE has embarked on a study of the impact of national environmental measures upon foreign trade. In addition, in the framework of an examination of environmental problems - industry by industry - with an aim to treating or preventing environmental disfunctions caused by economic activities, preparations have started for a seminar on the relationships between activities in the agricultural and forestry sector and environmental quality.

91. It seems relevant to give at the end of this section on development a brief survey of the UNDP activities to support environmental issues in its various projects. Development projects carried out by the United Nations family of organizations under UNDP auspices deal, inter alia, with such ecological problem areas as the development and utilization of natural resources, development of agriculture, urban growth, and industrial expansion. Development progress can and must be achieved without environmental deterioration. Major UNDP-SF assisted projects are mentioned specifically. In addition, a greater number of UNDP technical assistance projects also form part of the overall picture. Although they cannot all be singled out for special mention, the UNDP-TA projects with their provision of experts, fellowships and sometimes seminars on environment, and related problems have also played an important part.

92. Out of the vast reservoir of natural resources in the developing world, no less than 80 per cent is considered to be under-utilized. These include potentially fertile soil, mineral deposits, fishing grounds, forest lands, rivers for power production and irrigation. The experience of the industrialized nations, however, argues for a rational use of these resources, and this is the approach being stressed by international development experts and by the Administrator of UNDP.

93. Directed as its activities are to the acceleration of the economic and social development of the economically developing countries, the approach of the UNDP to the conservation and wise use of the environment is determined by the developing countries themselves. Heretofore, governments of these countries have sometimes been inclined to view problems of environmental deterioration as a price that might have to be paid for development. There has been a natural tendency to eschew adding such problems to the already formidable list of development hurdles to be cleared as part of the process of economic growth. Recent experience, however, suggests that such matters are now receiving greater attention, not only from governments, but also from international agencies and programmes as the harmful environmental side-effects of poorly planned and executed development - as well as the positive opportunities which frequently offer themselves in such properly planned situations - become immediately apparent.

94. UNDP and the Executing Agencies have already provided assistance for projects which are addressed to solving some types of "environment" problems. Among these are the man-made lakes projects in Africa whose very purpose is to help governments cope with the human and environmental consequences and opportunities arising from the construction of large hydro-electric power dams. Some are meteorological projects devoted to the study of the atmospheric environment. Other projects seek to improve the management of land and water resources and thereby help achieve environmental conservation objectives to the extent that they help reverse the deterioration of renewable natural resources. Still others are concerned with problems such as occupational health and safety or the provision of proper water and sewerage facilities in cities.

## F. Multidisciplinary aspects of ongoing activities within the United Nations system of organizations

95. There are at present only a few fields of human activity which do not have implications for man's environment, and this is largely due to the rapid growth of mechanization and the intensification of production in response to the ever-increasing demand for food, water, housing, transport, and other necessities of modern life.

96. As has become obvious from the earlier sections of this chapter the United Nations system, challenging this threat of environmental degeneration, has made use of its many and diverse organs over a very wide field. Generally speaking, the agencies concerned with the natural and life sciences are the ones which have undertaken the task of identifying factors which contribute to environmental deterioration, assessing the effects in each case, suggesting and sometimes taking appropriate remedial action. On the other hand, the agencies concerned with planning and management as well as economic and social development are the ones which have been mainly involved in the administrative and financial aspects of safeguarding the environment from a continued onslaught.

97. In the face of this situation there has been an unprecedented opportunity and need for co-operation and co-ordination between various organizations in the United Nations system. Co-operation and multidisciplinary approaches already exist in many instances such as in the World Plan of Action for the Application of Science and Technology to Development and in different ways, particularly in those cases where the structure of the organizations involved provides for such approaches but, in view of the horizontal structure of the concept of the human environment, the need for further developments is obvious and will be dealt with later on in this document. In the meantime, it has been felt pertinent here to conclude the presentation of the current activities of the United Nations system of organizations with some examples of ongoing interdisciplinary, co-ordinated efforts towards environmental protection and efficient use of natural resources.

98. In the field of human settlements several population problems have been dealt with in an integrated manner, and joint efforts between United Nations bodies have been made to cover different aspects of the migrations and growth of world population.

99. With regard to the protection of natural resources, the UNESCO programmes on the International Hydrological Decade, on Man and the Biosphere and the establishment of the Intergovernmental Oceanographic Commission operating in close collaboration with

and with the support of various other United Nations organizations, represent major efforts to co-ordinate both interdisciplinary and international research on the hydrosphere and the biosphere. This has paved the way for further integrated international activities in relation to these aspects of the human environment.

100. The agroclimatological surveys to study the climatological potentialities for agriculture in different parts of the world are a similar example. Since 1961 they have been carried out in co-operation between FAO, UNESCO and WMO. Further interdisciplinary co-operation is evident in the application of meteorological information to various problems of world food production. This is provided by the FAO/UNESCO/UNDP/WMO Interagency Group on Agricultural Biometeorology. The FAO/UNESCO joint project for preparing the Soil Map of the World and the WMO project for a World Climatic Atlas, in co-operation with UNESCO, provide important basic information to the efficient use of natural resources.

101. In the field of water resources, the United Nations Water Resources Development Centre (within the Resources and Transport Division) has served for many years as a focal point for inter-agency co-ordination of activities carried out by the United Nations system of organizations. Special attention is given by this centre to problems of international water resources development, including environmental questions, and particularly to the collections and dissemination of information through publications and the convening of annual meetings at which representatives from United Nations agencies (FAO, IAEA, UNESCO, WHO, WMO, etc.) attend to exchange information and to discuss co-ordination questions related to water resources development and policies.

102. In the area of energy development the respective advantages and disadvantages of nuclear and fossile fuel plants with regard to environmental safety are considered jointly by IAEA and WHO. More generally the IAEA, FAO, WHO and UNSCEAR collaboratively study the possible environmental hazards from peaceful uses of nuclear energy. A joint IAEA/FAO/WHO/ILO Emergency Assistance System was set up to ensure help in the event of a nuclear plant accident.

103. On the subject of environmental pollution, inter-agency co-operation has been organized in relation to marine pollution where the Joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP) involves seven agencies: UN, FAO, IAEA, IMCO, UNESCO, WHO, WMO; moreover, in the specialized field of radioactivity, UNESCO and FAO contribute to the IAEA Monaco Laboratory on Marine Radioactivity. Additionally, IMCO collaborates with IAEA in the operation of nuclear powered vessels and the maritime transport of radioactive substances.

104. Air pollution involves potential effects both to human health, plants, animals and the world's climate, and co-ordination of monitoring activities has been initiated between various agencies involved such as IAEA, WHO and WMO. Such organizations are either already operating networks for monitoring of air pollution or are planning to develop activities in this field.

105. With the object of setting international standards for food quality, FAO and WHO have jointly formed the Codex Alimentarious Commission. The standards will have special provisions for food activities, contaminants, pesticide residues, etc.

106. Whilst most of the organizations' programmes related to the subject of the environment are designed for world-wide application, it should also be remembered that many special studies at the regional level are carried out by the United Nations Economic Commissions, the structure of which provides opportunities for a multidisciplinary approach to environmental issues. In many of these studies particular attention has been paid to environmental problems involved in the development of natural resources and particularly water resources.

107. A recent example in this respect is the Seminar organized by the Economic Commission for Europe on the protection of surface and ground waters against pollution by oil and oil products at which experts from the oil industry and water experts jointly elaborated recommendations to Governments.

108. WHO is involved in assisting Member countries with diversified environmental problems, ranging from those common to developing countries to those faced by developed industrialized countries. WHO assistance comes mainly under three categories: provision of direct services, education and training of technical personnel, and grants for research activities. In addition, WHO is involved in promoting and co-ordinating research, and developing guidelines and standards of international application. At the national level, the areas of assistance cover urban and rural community water supply and wastes disposal, control of water and air pollution, environmental aspects of urban industrialization and of development of water resources for agricultural use, vector biology, communicable disease control, community mental health, family health, etc.

109. It should also be mentioned that the support of UNDP for operation by agencies of various development projects often provides excellent opportunities for bringing about a multidisciplinary approach to environmental problems sometimes achieved through joint execution of projects between relevant agencies.

## Chapter II

## ENVIRONMENTAL ORIENTATION OF THE UNITED NATIONS SYSTEM: FUNCTIONS AND PERSPECTIVES

110. In this chapter we analyse the programmes dedicated to the rational use and conservation of the human environment in terms of the component functions, and discuss the roles played by the organizations of the United Nations system in supporting these functions. This should help to identify the goals which need emphasis, to recognize places where organizational forms need to be modified or where there might be duplications of effort and to locate gaps in the overall programme for which available resources or existing organizational structures are inadequate. A functional analysis may also help in the formulation of a description of the contributions the United Nations system might make in solving problems of the human environment.

111. Unquestionably, the primary function of any international programme is to implement actions furthering the aims of the participating countries, but each action requires the best available objective knowledge in each sectoral facet. A scientific basis for rational decision-making is a requirement of all countries, even though the degree of emphasis each country assigns to a particular problem and the choice of alternative actions will depend on an assessment of the urgency of the problem, the level of development of the country, (the degree of concern over the quality of the environment) and other economic, cultural and social determinants.

112. The functions contributing to an understanding of problems of the human environment, that is, to the information base, are:

A. Information collection, interpretation, analysis and dissemination
Included within this category are the functions of exchange of information and national experience.

B. Monitoring and surveillance, including the development of sensors and indices of environmental change.

C. Research on environmental changes: their causes and effects

D. Development of scientific criteria and guides relative to environmental quality
Before actions can be planned in terms of the information available consideration needs to be given to:

E. Development of policy guidelines, including environmental economics
Functions more directly related to the implementation of actions are:

F. Establishment of national environmental institutions, legislation and standards, including enforcement

G. Establishment of regional and international agreements

H. Development of technology, including transfer of technology from the developed to the developing countries.

I. Education, training and public information

J. Co-operation on technical aspects

K. Funding

113. In the following sections general approaches to the performance of tasks within each of these functions are discussed. The special role of the organizations of the United Nations system is presented, and illustrative examples of specific agency or divisional activities are cited, together with instances of their immediate future plans. An attempt is also made to describe the current capabilities of the United Nations system as well as the functional gaps and problems which will require the attention of the Stockholm Conference.

## A. Information collection, interpretation, analysis and dissemination

114. Problems related to rational use of the human environment invariably cut across conventional disciplinary lines; the facts, insights and methodologies of many specialists have to be used. There is already a great quantity of information on many aspects of the environment. However, it has been gathered by discipline and in relative isolation from other disciplines. Facts and experiences garnered within one sector need to be organized into an information system before they can contribute most effectively to other sectors.

115. Primary information is collected largely on a sectoral or disciplinary basis by government organizations or academic and scientific bodies within countries. A disciplinary approach is to be expected because specialized professional knowledge and skills is required in the personnel carrying out information handling tasks. Each organization of the United Nations system carries out its information handling role for areas within the specific range of its statutory responsibilities. Included within this function are the tasks of collecting information and collating information received from different sources, performing analyses and exchanging results. In particular, a crucial function is to encourage and assist governments in the collection of appropriate primary information. This is important because collecting adequate and accurate primary data is a costly procedure but can be justified in terms of the specific needs of the countries.

116. The United Nations system of organizations has made various efforts towards co-ordination of exchange of information and is extending its activities in several instances. Co-ordination is needed to standardize terminology, assure compatibility of primary data formats, and to establish agreements on the indices of environmental change that need to be reported and on the techniques and instruments for making the observations.

117. Many environmental problems have their primary impact within one sector and the germane information functions are carried out by the agency with sectoral responsibility. For example, FAO continues to exchange environmental data relating to policies and planning in agriculture, forestry, fisheries, and other components of food production. Nevertheless, even here the problems cannot be dealt with in sectoral isolation. Instrumentalities and procedures for inter-sectoral co-ordination are required. For example, specialized information relevant to the atmospheric environment, the statutory responsibility of WMO, goes beyond the question of global factors and provides additional information to the study of agricultural meteorology with reference to land-use planning and agricultural management, and high-concentration air pollution with reference to the dispersion of pollutants.

118. A number of projects have gone forward under joint responsibility or with the aid of a collaborative or liaison mechanism. For example, WHO acts as the focal point for the compilation of basic documentation on subjects of direct health relevance, e.g. air and water quality, human waste disposal, acute and long-term health effects of pollutants, and health aspects of urbanization. ILO shares an interest with WHO in information on hazards of the working environment; and a liaison mechanism has been initiated.

119. Another instance of co-ordination is found in the area of nuclear reactions. IAEA collects information relevant to its broad aim of securing safe development of the peaceful uses of nuclear energy, while UNSCEAR analyses physical information contributing to the assessment of radiation risks.

120. A system for information collection and exchange about marine pollution is being developed by IMCO. A co-ordinated mechanism for providing scientific advice and information has been established; IMCO being the central administrative organization for the IMCO/FAO/UNESCO/WMO/WHO/IAEA and United Nations joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP).

121. UNIDO proposes to collect information on the availability of industrial wastes and the technological processes that can turn them into profitable products. Thus UNIDO's primary role in assisting industry of developing countries is extended to be consistent with their priorities.

122. The exchange of information between scientists and engineers from different countries is an important aspect of UNESCO's long-term programme. A feasibility study (UNISIST) on the establishment of a world science information system has recently been completed. The report furnishes guides for the collection and dissemination of information on the scientific problems of the human environment.

123. UNESCO is further concerned with the use of communication media in individual countries to promote an understanding of environmental issues and to enlist public support in a change of attitudes and policies which affect the conditions of human environment. Its communication programmes for popularization of science in out-of-school education projects aim at imbibing in the youth in particular, and the community in general, a scientific outlook basic to the attainment of harmony between man and his environment.

124. We repeat what has been stated earlier. Strengthening the information gathering systems within countries to ensure reliable exchange of information on local, national and regional conditions is of primary importance. The sectoral information systems of the organizations of the United Nations family are already functioning to integrate and disseminate information provided by national sources. Thus several agencies have proposed to extend this function to include greater participation from national information systems and to strengthen their part in promoting the exchange of information. Not all overlaps between information systems can be avoided (nor are they invariably undesirable) but gross duplication needs to be minimized, and mechanisms to ensure further co-ordination among the United Nations agencies will need to be refined.

125. In this connexion strengthening and broadening the activities of the United Nations Water Resources Development Centre which is already functioning as the focal point for inter-agency co-ordination particularly with regard to information gathering, deserves consideration as a future mechanism to ensure co-operation.

126. The Economic Commission for Europe has embarked on a comprehensive study dealing with the identification of information needed for workable environmental action and in the Second Stage of the inquiry to consider suitable international arrangements which

would facilitate and co-ordinate the exchange of existing environmental information among countries of the ECE region. ECE efforts are directed towards the exchange of national experience on the various problems posed in governmental decision making including the collection of primary and secondary information, and where possible the development of relevant statistics.

## B. Monitoring and surveillance, including the development of sensors and indices of environmental change

127. In recent years it has become generally accepted practice to refer to certain special aspects of information gathering with the terms "monitoring" and "surveillance". There is no accepted definition for these activities. However, monitoring activities may have different objectives and should therefore be defined with reference to these purposes. In general, these systems attempt to perform one or several of the following functions, such as:

(a) To detect and provide an early warning of significant changes in the environment;

(b) To study levels and trends of environmental factors for the purpose of deciding and planning corrective action;

(c) To check on the compliance with established environmental quality of criteria and standards;

(d) To check on the efficiency of control systems and corrective measures;

(e) To survey and study the effects of environmental changes, in particular on man's health, on natural resources, and on human activities;

(f) To study the effects of specific human activities on the environment for the purpose of deciding on the necessity of changing some of these activities.

128. Recommendations for monitoring and surveillance have been made for virtually every aspect of environmental change. Despite their obvious importance, adequate monitoring and surveillance are costly. Many programmes need complex facilities for data acquisition, processing and retrieval. Many environmental changes cannot now be adequately monitored but must await the discovery and refinement of new indices of change as well as the instruments to measure them. As a consequence, a strong economic and scientific justification must be made for each national monitoring programme and *a fortiori* for any undertaking at the international level.

129. Furthermore, it is clear that national institutions must bear the primary responsibility for establishing and maintaining these systems, and are clearly in the country's interest. Most of the great variety of environmental factors one might measure, whether it be the movement of people from the country to the city, the rate of soil laterization, the concentration of industrial pollutants in the air or the health of the people, are related to problems of the human environment largely confined to a community or region. The organizations of the United Nations system serve these interests by assisting member countries to establish monitoring and surveillance systems and providing advice on the policy level, developing compatible methodologies, and providing on request, analysis and interpretation of locally collected data.

130. However, the information obtained by national monitoring systems has international ramifications in at least three areas.

(a) National reports on different aspects of the environment when collated and compared can provide a picture of the global situation with respect to specific sectors. For example, FAO maintains an inventory, and periodically appraises natural resources used for agriculture, forestry and fisheries. In addition, comparisons of national experience can suggest measures to improve the quality of monitoring systems. Virtually every agency with responsibility for monitoring provides for the exchange of experiences by convening expert committees and authorities from national monitoring institutions.

(b) Certain activities undertaken by one country have an impact on other countries and require international collaboration to resolve issues; international trade and transport fall within this category.

(c) Water, air, industrial consumer goods, animals and people move from country to country. Since they may carry deleterious components with them (pollutants, toxic substances, disease agents), monitoring these components is of concern to all countries.

131. To deal with these areas the organizations of the United Nations system function to assist member countries in establishing joint monitoring activities for areas that require it. For example, the IHD sponsored by UNESCO in co-operation with WMO, WHO, IAEA, FAO and ICSU has established a programme to monitor river basin and estuarine conditions.

132. When a problem has global implications, for example, ocean and atmospheric contamination, the spread of infectious disease or potentially toxic chemical substances, the United Nations system needs to ensure that the relevant monitoring is carried out.

133. A number of specialized agencies have carried on monitoring activities for many years. Probably the best developed system is the World Weather Watch operated by WMO. In support of this, WMO operates various special monitoring systems and is establishing a network of rural stations around the globe to monitor background air pollution. WHO has long had a programme for the surveillance of communicable diseases and, more recently, for air quality in cities and industrialized areas, environmental radiation, community water supplies and for adverse effects of drugs. The WHO Assembly has endorsed expansion of activities on the human environment and inter alia "the development and co-ordination of epidemiological health surveillance by methods including environmental monitoring systems, in collaboration with other national and international efforts". A small group of cancer registries in key areas are collaborating with the International Agency for Research on Cancer (IARC) to determine the possibility of using a cancer monitoring system as an index of environmental change.

134. With a view to paving the way for the establishment of a global oceanographic monitoring system of characteristics of the high seas, the International Oceanographic Commission and WMO have recently engaged in a joint planning of an oceanic monitoring system known as the Integrated Global Ocean Station System (IGOSS).

135. Study of the long-term changes in the terrestrial part of the biosphere forms an important part of the MAB programme of UNESCO. It will need to include the monitoring of suitable parameters by field terrestrial and fresh-water stations. These activities will have to be related to the activities of the other agencies interested in following changes in the natural environment related to resource development, use and management, particularly FAO.

136. A crucial component of the human environment is man himself. The Population Division of the Department of Economic and Social Affairs of the United Nations is engaged in monitoring the size, structure and changes in human populations, as well as the interplay between demographic and socio-economic factors. The Department co-operates with specialized agencies studying trends in the economically active population,

agricultural population, school population, etc. To those countries anxious to control the growth of their populations the United Nations Fund for Population Activities, managed by the Administrator of UNDP, is available for technical advice and assistance.

137. UNESCO now participates in the world-wide campaign to achieve a balance between population size and the resources needed for a continuing improvement of its standard of living, and is particularly active in promoting the communication component of family planning programmes to bring about change in personal attitudes and group behaviour for better homes and better environment.

138. Programmes for improvements in the methodology of monitoring have also been proposed. UNIDO proposes to support the development and production of appropriate measuring instruments. ECE will initiate studies for the development of indicators of environmental quality and environmental improvement as well as on the relationships between population size, growth, concentration and mobility on the one hand, and environmental quality on the other. It has already started a survey and assessment of the state of environment in its region. WHO proposes to assist in the development of sensitive indicators of the deterioration of health and well-being (epidemiological indices).

139. The establishment of standard techniques and methodologies requires the assistance of the international scientific community, and several expert committees have been established by United Nations specialized agencies, for example, GESAMP, the Group of Experts on Pesticides Residues, etc. The United Nations system is also assisted by several non-governmental organizations which provide scientific background, methodological guidance in observation, collection and processing data within their fields of activity.

140. These programmes represent a substantial commitment to deal with the problems of the human environment, particularly since each agency must make its plans in terms of its limited resources. The secretariat function of the United Nations agencies in the area of surveillance and monitoring is central but it represents a fraction of the total effort. As we have observed above, the main contribution comes from the countries which will need to determine, themselves, whether or not to contribute more to environmental monitoring.

141. There are practical limitations to the possibility of integrating monitoring activities in different sectors, and in developing world-wide networks. As with existing systems, future planned monitoring activities will have to be developed first at local level and on a sectoral basis, prior to considering the need for inter-sectoral and global integration of these activities. Substantial benefits have been derived by integrating local systems. In most cases, global integration may be most useful for the exchange of information between systems, and for the co-ordination of their specific findings.

## C. Research on environmental changes their causes and effects

142. Among the recent scientific meetings devoted to problems of the environment, there has been universal agreement on the need to better understand the interactions and influences of environmental variables. Our current understanding of the environment is fragmentary and uneven. Currently available information and the results of monitoring are insufficient in themselves and need to be supplemented by a concerted research programme.

143. Most research activity, whether conducted within universities or national research institutions, is discipline-oriented. Even when the research has been problem-oriented (sometimes designated "applied research") methods tend to be drawn from one discipline. Since environmental interactions in the human ecosystem can be mediated by physical, chemical, biological, psychological, sociological, cultural and economic processes, environmental research is necessarily multi-disciplinary.

144. Currently the facilities for direct conduct of research within the organizations of the UN system are minimal and highly specialized. The principal function of the UN system is to promote, assist and co-ordinate research in national institutions. Each organization supports research within the scope of its sector by providing grants and fellowships, supplying experts and consultants, sponsoring symposia and arranging collaborative studies. For example, WHO maintains a Division of Research in Epidemiology and Communications Science but the great bulk of WHO's research effort on problems of health is carried out by some 200 International Reference Centres and Laboratories located in national research institutes, medical schools and universities. The International Agency for Research on Cancer (IARC), established by WHO, carries out a very important programme on research that includes inter alia environmental studies relating to cancer.

145. Fundamental research is a principal interest of UNESCO. UNESCO's intergovernmental and multidisciplinary programme on Man and the Biosphere (MAB) represents an effort to further fundamental environmental research and to study problems related to the use and conservation of natural resources. The intergovernmental character of this programme is maintained by the establishment of national committees from participating countries. The multidisciplinary character requires that the national committees be comprised of specialists in the relevant disciplines. It also needs a mechanism to ensure the co-operation of agencies of

the UN system and other international bodies. UNESCO has proposed that the organizations of the UN system be invited to join an Inter-Secretariat Committee to consider co-ordination in the implementation of the MAB programme, which will be directed by a twenty-five country Co-ordinating Council. The MAB programme is also naturally co-ordinated with other major international research programmes sponsored by UNESCO such as the IHD and the research programmes of IOC, which relate to specific areas of the environment.

146. The WMO network for monitoring background air pollution in low concentrations will provide the data for research on effects of changes in the chemical content of the atmosphere on climate. WMO in co-operation with ICSU administers the Global Atmospheric Research Programme which will use simulation with atmospheric models to describe the general circulation of the atmosphere and to study causes of climatic changes.

147. A main subject area for the Conference is the growth of population throughout the world, and the environmental consequences. The UN Department of Economic and Social Affairs plans to continue research in demographic projections, and studies of population policy. With the regional economic commissions, these studies will focus on specific problems of different world regions. They also intend to promote and to do research on related problems, such as distribution policy alternatives and their relation to resources development. These studies may be co-ordinated with social science and cultural research programmes of UNESCO that deal with man-nature relationships.

148. The UN Centre for Housing, Building and Planning has proposed a research programme to define regional planning activities and structures within a national planning framework, methods of data analysis and the development of the art and science of regional planning. Complementing the centre's activities are certain research goals of WMO, in urban climates and building climatology; FAO in effects of soil erosion and degradation, land uses and farming practice; WHO in urban health planning and the psychological dynamics of urbanization.

149. Environmental research is often an integral part of other investigations. An instance in point is the research of FAO on the quality and quantity of production in the field of agriculture, forestry and fisheries. FAO, since its establishment, has promoted research on the effects of different types of land use on the environment, the conservation of natural resources, as well as adaptive research on the effects of specific management practices as the use of agro-chemicals.

150. In most circumstances the specialized agencies promote research by supporting the efforts of co-operating national research institutions. The agencies will serve the same role vis-à-vis research on the human environment. Indeed, many programmes initiated on narrower sectoral grounds are quite definitely directed to environmental issues. Finally, the agencies can serve as intermediaries between the international scientific community which will carry out the research and the representatives of governments who must suggest priorities and supply funds in accordance with their particular needs and resources.

151. The Economic Commission for Europe concentrates on research on the socio-economic effects due to the deterioration of the environment, and so far in particular the damage caused by air and water pollution. It is aimed that methodologies should be developed which could assist Governments in assessing with reasonable accuracy the economic losses due to such pollution. In addition, much effort has been given to promoting co-operation in urban and regional research aimed at environmental improvements.

152. Clearly, much more research is needed if the global problems of environmental change are to be understood and controlled. While the urgent need for immediate action may have the highest priority, in many areas national action cannot yet be taken. The countries will first need to establish priorities in specific problem areas and support a continued programme of scientific research.

## D. Development of scientific criteria and guides relative to environmental quality

153. Scientific criteria and guides are statements of the effects that certain environmental factors are likely to have on the health and well-being of man, or on the economic, social and aesthetic values of the things man needs or cherishes. They should express the best available scientific knowledge of the relation between a specific condition of the environment and its putative effects. Since these criteria and guides are intended to be used as a basis for reaching decisions on courses of action, they may need to be established before the cause-effect relationship has been verified definitively.

154. Clearly, different types of criteria and guides are required for the different activities of the member countries and organizations of the UN system. Among these we may mention activities relating to -

- components of the environment for which a direct effect can be found on the health of the individual human being;
- control of pollutants which have ecological, economic and other effects deleterious to the quality of life;
- conservation and management of natural resources;
- planning of economic development, human settlements, transport, etc.

155. Here, the major function of the UN system is to co-ordinate the formulation of criteria and guides and to promote their common use by the member countries.[1]

156. At the present time, criteria and guides are available for relatively few environmental factors. The lack of suitable criteria represents a serious gap in the armamentarium of technical resources that are required to deal with the problems. In view of the need for development and periodic review of internationally acceptable environmental criteria, a number of UN agencies have given this activity high priority within their programmes.

157. Among the factors affecting health directly that require the establishment of criteria and guides may be included certain chemical and biological pollutants, considered singly or in combination, and present in air, water, land or food; physical

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[1] Note that this is in contradistinction to legal standards or norms and codes of practice which will vary from country to country depending on local conditions. This is discussed in Section F.

factors, such as radiation, temperature, humidity and crowding. The working environment requires a somewhat different set of criteria because of the intensive nature of exposure to a variety of factors such as solvent vapours, noise and vibration. WHO has made plans to prepare guides for various pollutants in air and water, including toxic chemicals, micro-organisms, and viruses. In many cases the preparation of these guides will be carried out in concert with several agencies. Guides for substances contained within food, such as pesticide residues, are to be jointly prepared by FAO and WHO; guides for environmental exposures and the safe use of products employed in industry are the responsibility of ILO with WHO. Criteria and guides for radiation exposures or radionuclide concentrations and their hazards have been prepared and kept up-to-date by ICRP and IAEA, with WHO and ILO. Techniques for forecasting air pollution potential from meteorological data being developed by WMO will be used in the elaboration of criteria for air quality of industrialized and urban areas.

158. Product quality is an important aspect of the human environment which influences health and welfare. In view of the number and kind of processed items, and the likelihood that there will be an even greater number, current attention to the formulation of criteria for product quality is inadequate, and must be regarded as a serious gap in the current programme.

159. The newly established global network of background stations which is being promoted by WMO can, if need arises, serve as the source of useful data in preparing criteria for air quality at regional or global levels.

160. There are factors in the environment that are either too complex for our current understanding, or too poorly understood to admit a well-defined and quantitative treatment. Nevertheless, the judgment of technical specialists can provide a basis for evaluation. For example, assessment of housing quality may involve such physical factors as floor area per occupant, heating, air circulation, illumination and insulation, as well as aesthetic, economic and social consideration.

161. In the area of pollutant control, the UN, through its Department of Economic and Social Affairs, plans to extend its programme of preparation of criteria and aids to environmental management and preservation of water quality, including airborne products of combustion, thermal pollution of water, and chemical pollution by contamination from fuel mining operations.

162. Marine pollution is an area which will involve a number of agencies in the formulation of criteria. The ocean, estuaries, fresh water inflow, the overlaying atmosphere, and the many sources of contamination form a complicated medium. IMCO and the joint inter-agency group, GESAMP, will address itself to these problems.

163. One of the main areas of concentration of FAO is directed toward the further development of criteria and guides which are essential to resource management and conservation: soil, water, genetic resources, rangelands, fisheries, and the like.

164. Special mention may be made of the need to develop criteria and guides for the preservation of monuments, groups of buildings and natural or man-modified sites. UNESCO is preparing recommendations in this field, under its Man and the Biosphere Programme.

165. WHO has an appreciable interest in this programme, which is soon to start. WHO, together with its Regional Offices, is prepared to play its appropriate role in the implementation of the Programme, particularly in the recognition of health effects of the changing environment, to promote environmental control and to assist by the establishment of effective machinery for the prevention of damage in the human environment. The International Agency for Research on Cancer (IARC) is establishing a complete study of the environment in relation to cancer at a specific body site. This approach should form the pattern for all future studies of this type.

166. The formulation of technical criteria and guides is an ongoing process, involving recommendations from specialists drawn from the international scientific and technical communities, review and criticism by meetings of experts, and continuous refinement on the basis of experience and new knowledge. In most instances the sectoral orientation of the UN family provides an efficient mechanism for elaborating and promoting these guides.

167. The problem of dealing with new environmental issues will require an expansion of these activities, while the complexity of environmental problems and their multi-disciplinary character might demand a greater degree of co-operation among the agencies.

## E. Development of policy guidelines, including environmental economics

168. A function of the intergovernmental agencies which is closely related, but conceptually different from the set of activities discussed above, is to provide assistance to countries in the development of policy guidelines for action. In this instance, the function is to show how the scientific criteria and guides can be used as the bases of policy guidelines or "codes of good practice", appropriate to the special economic, social and cultural conditions of a country, and directed toward development and resource management, planning and action for man's benefit, taking into account measures to conserve the environment, to control it and to rehabilitate environments which have been damaged.

169. The adoption of a set of principles for overall international strategy for the problems of the human environment involves all member countries; they are of major interest to the UN Conference and will undoubtedly be brought before the General Assembly for agreement.

170. It will be necessary to ensure that the policy guidelines developed by the special agencies and their governing bodies are consistent with the common principles for environmental action. Precedents for co-ordination in such matters exist; observers from the organizations of the UN system might attend meetings of an intergovernmental working group established for this purpose or co-ordination might proceed within the ACC Functional Group on the Human Environment. Furthermore, policy guidelines formulated within one sector need to be consonant with those of other sectors. An instance of such co-operation is that between FAO and WHO on guidelines for use of pesticides.

171. Until quite recently most environmental deterioration, whether by improper use of resources or by pollution, was not considered in economic terms, but rather as vague, largely psychological costs borne in some way by the community at large. It is essential that countries weigh the explicit economic costs and efficiencies of alternative procedures for environmental management as well as the losses, economic and otherwise, due to inadequate consideration of environmental factors in planning for growth.

172. While several organizations within the UN system are carrying out studies on environmental economics - for example, GATT is studying industrial pollution control and foreign trade - much remains to be done, particularly as these studies relate to the special situations of developing countries.

173. The emergence of widely-accepted environmental criteria and standards will exert a strong influence on industrial activity and is expected to emphasize the need for an anti-pollution policy for industry. UNIDO is concerned with this aspect of the problem and is considering the feasibility of some sort of environmental rating of different industrial branches as a first step towards the formulation of such a policy.

174. The UN Division of Public Finance and Financial Institutions has undertaken a study to investigate taxes and special charges that could be used to abate pollution at the source by making it costly for firms causing ecological damage to continue these practices, or to find revenues to be earmarked for the prevention or the repair of environmental damage.

175.The WMO has established a panel of experts to study the application of meteorology to economic and social development. Further special studies are being planned, such as the relationship between climatological information and efficient land use.

176. The regional economic commissions can be expected to play important roles in studies of environmental economics. ECE has continuing and projected studies on the impact of national environmental measures upon foreign trade (with UNCTAD and GATT), on development of tools and methods for governmental decision-making on environmental problems, on a programme to develop a methodology for assessing the economic effects of air pollution and elaboration of a method for determining the economic losses caused by water pollution. It has already carried out some studies on various fiscal policies and economic incentives which would encourage environmental improvements. Furthermore policy guidelines are laid down in the ECE Declaration of Policy on Water Pollution Control and in the ECE Recommendations on the Protection of Ground and Surface Waters against Pollution by Oil and Oil Products, on one hand, and on the Control of Sulphur Oxides Emissions, on the other.

177. In some fields environmental economics are in large measure included within production economics. FAO has recognized this in developing policy guidelines for forests, fisheries and agricultural lands to achieve stable harvest without depleting natural resources.

178. Realistic guidelines can be of substantial benefit to both developed and developing countries. Since the ratio of benefits to cost of preparing policy guidelines and codes of good practice are likely to be highly favourable. The UN agencies have recognized their importance as part of the respective agencies prospective programmes of work.

179. It will be recognized that although the guiding objective of such a policy should be the minimization of the negative environmental impact of industrial development, there will be additional constraints in the form of the industrial weakness of the developing countries, the limited availability of financial resources to their industrial sector and the necessity to provide adequate incentives to industry to stimulate its development rather than saddle it with burdensome regulations. UNIDO will endeavour to safeguard the interests of the industrial sector. Within this framework, it will undertake comparative surveys and appraisals of national standards relating to industrial pollutants and nuisances.

180. In virtually every programme cited earlier, objectives include the provision of guidelines that take into account current technological methods and well tested procedures. Illustrative of the range of planned activities are the often collaborative undertakings of FAO, UNESCO, WMO and the UN Department of Economic and Social Affairs to provide guidelines in land use planning and use of natural resources. The Department through its Resources and Transport Division proposes to formulate principles for the systematic treatment of the consequences of environmental change as economic variables to be used in feasibility studies of mineral resource development projects; the UNIDO contemplates assistance to selected industrial branches such as the fertilizer, pesticides, and pulp and paper industries in drawing up guidelines for minimizing noxious gas emissions; IAEA foresees activities to extend and revise guidelines for the safe use of radioactive tracers in industrial processes and for safety analysis in designing and operating nuclear power plants.

181. Countries have begun to recognize the serious consequences that may follow from regarding the ocean as an inexhaustible source of food and as a sink for waste materials. A variety of initiatives have already been taken; for example, IMCO plans the early publication of a guide for implementing contingency measures for oil spillage from tankers and other sources.

182. Manuals of good practice are available for only a few of the human activities which contribute to degrading the environment. Even the fields of environmental and occupational health which have furnished standards of practice for many years will need to extend their activities beyond the narrow "classical" areas of concern. The guidelines being prepared by WHO for air pollution control, hygienic housing design, sanitary community water supply and waste disposal will eventually be integrated into an "environmental health code".

## F. Establishment of national environmental institutions, legislation and standards, including enforcement

183. To deal with the problems of environmental management even modest attempts at the national level entail the creation of an institutional structure and a legal framework to guide the regulatory activities of an environmental control programme. The institutions and regulatory services are responsible for the conduct of a chain of activities beginning with information-gathering and analysis to develop legal standards; preparation of the legislation to establish the standards; inspection to verify compliance or infringement; maintenance of regulatory services for the enforcement of standards, and finally, educational programmes to explain the regulations and to enlist the participation and enthusiasm of the public.

184. Institutional inadequacies constitute a serious obstacle to progress, particularly if the institutions are responsible both for the economic and social goals of development programmes, and the protection of the environment and man's health. The dynamism of development tends to create problems in synchronizing the physical progress of development with the essential concomitant changes in human affairs including settlement and occupational patterns, transportation, education, health and social services. Given the current weak infrastructure and facilities of most developing countries, and the high costs of new institutional arrangements, it is reasonable to expect that progress will be in the direction of strengthening existing institutions with closer co-ordination between the production-related aspects and the social and health aspects of environmental management.

185. There is at present no common pattern of institutional arrangements among the member countries for dealing with environmental problems. Environmental Ministries have been created in some of the developed countries, but for the most part, the existing institutions carry out the requisite activities on a sectoral basis in Health, Labour, Agriculture, Housing, Social Welfare, or Economic Ministries. Some governments have developed co-ordinating mechanisms in the form of inter-ministerial councils or advisory committees.

186. In view of the foregoing, the organizations of the UN system have two functions: to advise and assist governments on institutional matters within the agency's sectoral responsibility, and to encourage a close association between people responsible for environmental aspects and those responsible for other aspects of administration. This latter entails co-ordination between institutions within countries and collaboration between the relevant UN organizations to assist on intersectoral problems.

187. So far as direct assistance to countries is concerned, UNDP has for example already helped countries in establishing or strengthening national institutions concerned with aspects of environmental protection e.g. in Brazil, Chile, Kenya, Poland and Iraq. Other projects are under consideration in connexion with UNDP country programmes currently being prepared. As has already been indicated, each of the institutional functions is complemented by activities within the organizations of the UN system and in this way all the factors may contribute to strengthening national institutions. In addition, each agency recognizes an obligation to strengthen the infrastructure by supporting training programmes for technicians, administrators, enforcement officers, etc. Field demonstration programmes are conducted. Preparation of manuals, handbooks and field guides contribute as well.

188. Future activities related to the human environment will have to be performed on a permanent basis and will require a solid legal, and institutional framework so that they may be implemented by national technicians. Legislation will not only be designed to prescribe regulatory or remedial actions, but to define the proper scope of activities for enterprises involved in resource development.

189. It is generally believed that the basic legal framework for environmental management can be built into the overall resource legislation of a country. Specific legislation will undoubtedly be required; many problems cannot be adequately covered in the general legislations.

190. The UN organizations provide legislative information services and provide advice at the request of governments for drafting legislation and law reform. On a regular basis, the agencies collect, process and disseminate information regarding legislation adopted by countries relevant to each sector. They also prepare analytical and comparative reports on legislation. Advice relevant drafting legislation is provided either through a permanent staff of legal specialists assigned to headquarters or regions, or by special recruited legal consultants who are provided with administrative and research support.

191. The ECE has already carried out some preliminary inquiries on national institutional arrangements and supporting legislation, but these are still in a state of flux in many countries and further studies will be made with particular emphasis on the co-ordinating machinery at different government levels and between different sectors of activity.

192. Establishment of legal standards of performance and safety, whether for industrial or agricultural practice, permissible levels of contaminants, product quality and safety, or legal codes governing working conditions, are all highly specific. Since it is only possible to apply standards for control within a background of appropriate legislation, the two issues cannot be separated. The technical issues raised by questions of standards are resolved by meetings of specialists, followed by publications of their findings and dissemination to member countries. For example standards and codes of practice for environmental safety have been established by IAEA in collaboration with WHO, FAO and ILO. They are recommended to member states and advisory services are furnished. As an important practical mode of action IAEA makes its technical assistance conditional upon the existence of adequate safety standards.

193. Special mention must be made of problems of enforcement for they are often the major bottlenecks in the chain of action referred to above. Many governments are unable to enforce existing environmental legislation, even less new regulations. Apart from the fact that regulatory services of the central government in most developing countries have run down in the post-independence period, enforcement will fall to a large extent on local governmental bodies which are not strong enough to shoulder this burden.

194. The question of the enforcement of international standards and agreements must arise. The experience of the ILO in supervising the application of its Conventions and its recommendations, which cover a wide variety of questions including extremely sensitive ones relating to human rights, is relevant.

195. While the organizations of the UN system have been aware of the need for realistic national enforcement practices and have responded in some measure, for example, by preparing documents dealing with the organization of regulatory services, it is evident that a great deal more needs to be accomplished. Collaboration between the UN Public Administration Divisions and the special agencies should provide some guidance in assisting governments to find suitable solutions to enforcement problems. Nevertheless, provision of assistance in enforcement practice will require substantial expansions of effort and financial resources.

## G. Establishment of regional and international agreements

196. Human activities, industrial and otherwise, have created problems of environmental changes that cannot be solved by national measures alone but which require regional and international agreement. Environmental effects can scarcely be expected to obey political frontiers. Isolated efforts of individual countries to enforce standards of good environmental practice will fall short of the goal if they are not accompanied by similar efforts from other countries in the same region. Furthermore, the costs incurred in order to adhere to stringent standards will put the industrial and agricultural development of one country at a competitive disadvantage to other countries which abstain from a common accord.

197. Environmental damage caused by industrial products in their intended use is quantitatively the most significant source of damage, but corrective measures are not likely to present international trade problems new in kind. They are another example of the need for standards comparable to safety regulations already in force for motor vehicles, pure food laws, safety and efficacy requirements for new pharmaceuticals, etc. General rules governing use of such measures exist, for example, in GATT and work is in progress on more precise principles concerning use of product standards including technical specifications for pollutants to avoid undesirable effects in international trade.

198. In the respect of transportation, a useful contribution to the prevention of water pollution is being made by the ECE through its work concerning the safe packing and conditions of transport of substances which may pollute water. Several agreements in this field have been concluded and are in force in ECE countries. Consideration is also being given by the ECE to promoting international arrangements between contiguous countries aimed at resolving specific environmental problems to areas of their common interest.

199. The trade problems posed by noxious emissions and wastes from industrial processes deserve special attention because industrial production will be affected by the enforcement of controls. It is expected that industrialized countries will establish norms specifying the maximum admissible levels of polluting agents in effluents, but the degree of stringency will depend on the extent of the activities causing the pollution and their spatial distribution in each country. The developing countries may have good reason to reject exacting norms because in the long-run technological progress will reduce pollution control costs, and growth of national income will make these costs easier to bear. Thus, the priorities of developing Countries will necessarily favour growth and development.

200. The fact that the new pollution control cost differences among countries would result directly from government regulation would not make them unique; national standards concerning labour, social security, taxation, health hygiene, and safety already have a varying impact on costs from one country to another. But none of these differences is recognized as justifying protection of domestic production, and it is by no means clear that it would be wise to regard pollution control measures as an exception. If the pollution control case is different, the peculiarity resides in the welfare aspects of the problem, its magnitude, its greater urgency for some countries than for others, the disparity in prospective costs in different sectors, and the advantages of handling the problem by incentives rather than by mandatory regulations.

201. The organizations of the UN system are experienced in supporting the actions of governments to establish international agreements. For example, IAEA has promoted and will continue to foster international or regional agreements on the release of radioactive wastes into the seas, the registration of radioactive releases and the establishment of international disposal areas. Eleven multilateral treaties concerning natural resources management have already been concluded within the framework of FAO. ILO has contributed to the acceptance of a wide variety of International Conventions and Recommendations concerned with conditions in the working environment. Unesco has prepared the Hague Convention on Protection of Cultural Property in Armed Conflicts and is preparing a new convention on the preservation of the cultural and natural heritage of mankind.

202. In many instances co-ordinated agency programmes are needed. There are precedents in the area of international agreements or standards for control of environmental factors, for instance the joint FAO/WHO activity is support of the Commission for the Codex Alimentarius.

203. An example of projected agency activities is afforded by the decision of the IMCO Assembly (Resolution A.176 (VI)) to convene, in 1973, an international conference on marine pollution for the purpose of preparing a suitable international agreement for placing restraints on the contamination of the sea, land and air by ships, vessels, and other equipment operating in the marine environment. In October 1971, the Assembly further decided that the 1973 conference shall have as its main objective the achievement by 1975 if possible, but certainly by the end of the decade, the complete elimination of the wilful and intentional pollution of the seas by oil and noxious substances, other than oil, and the minimization of accidental spills.

204. The question of the enforcement of international standards and agreements must be considered. The experience of the ILO in supervising the application of its Conventions and its Recommendations, which cover a variety of questions, including human rights, is relevant. Member governments must submit regular reports to the ILO on measures taken to present new instruments to the competent legislative authorities and to apply Conventions already ratified. They are also obliged to submit reports, when requested, indicating the degree to which their legislation and practice give effect to unratified Conventions or to Recommendations. A committee of independent experts examines the reports and relays its findings to governments, ILO's Governing Body, and to the annual Conference. The results of this technical examination are studied by a Conference committee of government, employer, and worker delegates. They discuss problems of application with representatives of the governments concerned. As a further safeguard, formal representations of non-observance of a ratified Convention may be lodged and may be examined by the Governing Body or by commissions of inquiry.

205. Concern with environmental problems may well require general agreements going beyond current sectoral boundaries. The UN and its organizations will require mechanisms to facilitate agreements of this character in the period following the Stockholm Conference. At the same time, the priorities established by States in the UN Conference will include items of specific sectoral relevance. In these cases, the proposed actions would be undertaken by particular programmes of the agencies, as modified in accordance with the deliberations of their governing bodies.

## H. The development of technology, including transfer of technology from the developed to the developing countries

206. Much of the technology for environmental protection and management already exists, but the techniques are costly. Consequently, development of new technology is carried on almost exclusively within nations having substantial economic resources. The time lags between technological development and application, and the additional delays in the transfer of expertise to the developing countries are long. Furthermore, technology suited to the specific needs of developing countries is frequently lacking because there is little incentive within the developed countries to create technology that has minor utility at home.

207. As an extreme example, but of direct health relevance to a very large fraction of the world population, there is need for simple and cheap techniques to supply safe drinking water, to dispose of solid and liquid wastes, and to control industrial air pollutants in work places. Hand pumps, methods of water extraction from surface ponds, simple chlorinating devices, basic design data for waste water treatment systems using local materials and construction methods may not represent major challenges to the ingenuity of technologists, but they are not currently available to the human beings who need them.

208. The UN system of organizations functions in this area by advice, assistance and information exchange with respect to existing technology, pointing out the gaps, and assisting in the transfer of technology from the advanced countries to the less advanced ones.

209. It is much more economical to incorporate environmental protection schemes at the onset of development schemes, than to ameliorate a degraded environment. Here again we can see a role for organizations in the UN system, particularly those acting as executing agencies of the UNDP. Illustrative of activities carried out by the UN agencies or programmes with this philosophy are UNIDO schemes for industrial development, FAO and WHO co-operative assistance in agricultural development, the UN Resources and Transport Division (with WHO) for comprehensive water resource development.

210. An efficient way to help the developing countries is to increase their capability for research and development of environmental protection technology. This has been done, for example, in India by developing (as a UNDP/SF/WHO project) the Central Public Health Engineering Research Institute in Nagpur. Many Unesco, FAO, UNIDO, and IAEA projects assisted by UNDP have similar aims and a variety of similar projects are being considered.

211. Many developing countries possess raw material resources but they lack the technology for the manufacture of equipment, chemicals, and other supplies. Assisting them by providing the know-how will constitute an important element of international assistance. UNIDO is an agency with special competence in this field. In some circumstances, it may be feasible to control pollutants and produce marketable by-products. For example, ammonia may be used to remove sulphur dioxide from power station flue gases. One of the resultant products is ammonium sulphate which has use as a fertilizer. Both UNIDO and the UN Resources and Transport Division carry out research programmes related to such problems.

212. There are several sectors for which advanced technology is clearly required. In the future more reliance may need to be put on physico-chemical treatment processes to renovate waste water so that it can be re-used directly. The research potential of the chemical industry needs to be applied to this field and organizations such as UNIDO and the regional economic commissions will continue to contribute to this task by study programmes, conferences, and assistance to research. The UN Resources and Transport Division will study the application of electrodialysis and reverse osmosis technology to "marginal desalting".

213. Development of alternative methods of energy production is particularly important both because conventional power plants are major sources or air contaminants and the projected power needs in the years to come are great. The IAEA promotes and co-ordinates technical development with particular reference to the safe design and operation of nuclear facilities. The UN Resources and Transport Division will in the future devote a considerable part of its work to finding alternative energy sources, and is convening a panel of experts to evaluate the feasibility of the use of solar energy, tidal power, geothermal power, etc.

214. To a great extent the technological solutions are known but the current costs of application are beyond the resources of the developing countries. There is a clear need for applied research, development and rapid technology transfer. The current activities in this field by the UN system of organizations are still too limited in scope. However, as has been pointed out the several agencies have contributed within the limits of their resources and could increase the pace of activity if financial means were made available.

## I. Education, training and public information

215. Education and training are important to problems of the human environment at several different levels. Education can be directed towards the means and methods to develop an awareness of nature and a sense of involvement in the care of the environment. The study of nature has always figured in school curricula, however, the relation of nature to man's life has not been brought out clearly.

216. UNESCO is giving increasing emphasis to environment studies within the framework of general education. The function of Unesco can be categorized as the exchange of information on the status of the environmental education movement, curriculum organization and assistance to Member States. UNESCO is studying the possibility of organizing multi-disciplinary courses on environmental problems as part of a general undergraduate curriculum. The study of environment in schools will be supported within the framework of the Associated School Project of UNESCO. This world-wide group of schools will be furnished with suggestions for source materials and project activities on environmental issues. This co-operation facilitates an exchange of views and materials for the comparison of conditions, problems, and possible project activities in the countries of the world. UNESCO. and other agencies of the UN system, are also interested in developing environmental education beyond the undergraduate level.

217. As part of the MAB programme, specialists will be trained in various aspects of modern ecology, including remote sensing techniques, systems analysis, biomodelling, etc. National and regional training and research institutes will be created or strengthened, in some instances with UNDP assistance, in the field of integrated study of natural resources and in ecology, particularly tropical ecology. An interesting example of such a centre exists in Iraq in the Institute for Applied Research on National Resources, which is being executed for UNDP by UNESCO.

218. In addition to the efforts to educate people at all levels to an awareness of environment there is need to train industrial and agricultural personnel in the techniques of environmental protection and management. For example, most of the technology currently used in the production of energy has been developed with only scant reference to the levels of pollution to which it gives rise. Consequently, the vast majority of technologists engaged in this industry have only a meagre appreciation of the polluting propensities of their industry and of recently developed technology for pollution control.

219. ILO activities furnish another example. Training, advice and assistance are provided to managers of industrial undertakings through the national management development centres under the ILO Management Development Programme and cover the management aspects of industrial health and safety which have a direct bearing on the protection of the working environment.

220. Since more than fifty per cent of the world population are farmers and many others are employed in forestry and fisheries activities, mention should be made of the role of FAO in educating farmers, fishermen and others, in training medium-level technicians and university-level specialists. In these fields, environmental protection and conservation of natural resources necessarily form an integral part of educational programmes.

221. The successful health control of the environment depends not only on the support of the political authorities but also on the professional quality of the relevant health personnel. This applies in particular to the category of sanitary engineers and medical hygienists, as well as to that of sanitary inspectors and sanitary "feldshers".

222. WHO assists its Member States in the education and training of all categories of personnel in the public health field. For this purpose, the Organization has devoted a substantial part of its resources towards meeting this need. WHO's assistance in training of personnel for sanitary control has undergone change in line with the evolving needs of different parts of the world.

223. Fellowships to officials of Member governments for higher studies, usually abroad, have been a major programme of WHO ever since its inception. This form of assistance has grown over the years and a considerable number of contemporary public health personnel have been trained in this way. Besides this, almost every environmental health field project has a built-in provision for fellowships to national counterpart staff. Fellowships also form an important part of UNDP assisted pre-investment survey projects, for which WHO is the executing agency.

224. Apart from fellowships, WHO has special grants for award to research scientists either for further training or on exchange visits. These grants can be awarded to individuals upon request to WHO. The International Agency for Research on Cancer (IARC), in its own fellowship programme has given primary emphasis to training young scientists in environmental biology.

225. In collaboration with other international agencies, namely with Unesco and with the Inter-American Association of Sanitary Engineers, WHO has worked on a glossary of engineering terms designed to assist understanding of technical information by different language groups.

226. As a result of surveys, consultantships, scientific groups, symposia and expert committees, WHO has published over the years a number of documents on the education and training of environmental specialists.

227. Another function of the UN agencies is to contribute to the training of environmental specialists by encouraging and helping national educational institutions to expand their managerial, engineering, and applied research curricula. For example, WMO has assisted in the establishment and support of training institutions whose curricula is centred on atmospheric science. IAEA conducts training courses for specialists in radioactive waste management and radiological safety. The training of environmental health personnel is given high priority by WHO and is implemented by a programme that includes individual fellowships, carefully planned training courses and seminars, and the establishment of centres for training and applied research. Unesco is running a number of programmes in this field at the national, regional and international levels on such subjects as ecology, hydrology or oceanography.

228. Training programmes undertaken by the UN agencies usually include several facets. At the individual level, fellowships are awarded to qualified administrators or technologists with a view to introducing them to modern techniques of pollution control. Seminars are frequently organized to provide groups with information about problems of pollution within their industries, and the principles for pollution management. Symposia enable scientists and engineers throughout the world to discuss particular environmental aspects of mutual interest.

229. Despite the breadth and level of effort devoted to education and training in the UN system of organizations it is recognized that needs for educational programmes related to the human environment at all levels and ranging from general education to specialist training cannot now be met within existing resources. Since education is a slow and continuing process, it is not surprising that the emphasis for early action has been directed to the immediate problem of environmental deterioration. Nonetheless, in the long run the success of any environmental programme will depend on the attitudes, the understanding and concern of people in all walks of life.

## J. Co-operation on technical aspects

230. Since the inception of conference planning the General Assembly, as well as the Preparatory Committee for the UN Conference on the Human Environment and its secretariat, have been aware of the varying kinds of concern with environmental questions which exist in countries. They have also been cognizant of the apprehension of representatives of certain developing countries that pre-occupation with such problems as pollution would lead to diminished attention and resources for the industrialization and development of under-developed nations.

231. Most students of problems of the environment are persuaded that there exists no fundamental conflict between the requirements for economic development and environmental protection, but it is agreed that a major effort is needed to arrive at a balance of factors so that efforts to take into account the requirements of an environmental protection programme will not penalize and diminish the momentum of rational resource development.

232. The UN system can play a significant role in this context. For instance direct assistance to developing countries through UNDP can help them make efficient use of their natural and human resources while at the same time ensuring that the fabric of the environment is not destroyed by the effects of improvident actions.

233. Since so many environmental problems are directly related to development processes, their solutions must be seen as a part of planning for development. This focuses attention on the adequacy of planning for major development schemes, particularly at the "pre-investment" stage of surveys and feasibility studies. Eventually the whole pre-investment process beginning with initial general surveys may be so oriented that information on environmental impact questions is generated at the same time that information is being obtained to prepare development schemes for capital investment.

234. The following outline of the sequence of events related to environmental assessment, anticipated as a part of planning for technical co-operation programmes dealing with development in any sector which falls within the competence of the UN system of organizations, may serve to put the functions of the organizations of the UN system into proper perspective.

235. Identification of environmental problems would be the first step and would include: the assessment of the scope of environmental problems by sector and geographical area; surveys and appraisals of major degradation possibilities, pollutants and nuisances derived from such activities; determination of the actual status of particular countries in relation to critical levels of pollutants; and identification of conservation and anti-pollution projects serving several countries.

236. This would be followed by the formulation of measures to deal with the problems and the provision of assistance to facilitate their implementation. Action in this respect will have two broad aspects. On the one hand, there will be action of a technical and economic nature involving such factors as the establishment of pilot plants for re-use of wastes, the adaptation of existing pollution reducing techniques and standards in force in other countries to local conditions; and the establishment of technical facilities for carrying out tests and research on alternative processes of abating resource degradation. At the same time, it would involve actions dealing with questions of policy, institutional and financial arrangements, including: the formulation of resource conservation measures; the introduction of incentives to promote the abatement of pollution with special regard to local conditions and the particular economic sector involved; the provision of financial assistance to developing countries for abating environmental degradation arising from industrial development; the extension of information services to cover re-cycling, waste disposal, and industrial pollution in general.

237. While the main elements can thus be distinguished in broad terms, the form they will assume in practice and the relative priority among them, cannot be determined *a priori* but will need to be decided on a case by case basis.

238. The existing machinery for most development projects calls for a tripartite structure: a national institution responsible for carrying out the work of development, an agency of the UN system to assist in steps outlined above as well as in the several functions described in this chapter, and a funding agency, most probably UNDP. A special obligation is placed on UNDP which will be called upon to assure that the environmental implications of the pre-investment projects it assists are adequately considered during the technical appraisal of requests, and during the surveillance of projects as they are being implemented. As UNDP moves to a strengthened role in advising governments about country programming for development, its resident representatives will perform the role not only of making appropriate suggestions about development, but also of encouraging planners and other technical specialists to consider the full range of implications of schemes under consideration.

239. There is little doubt that environmental considerations, long a component of technical co-operation in programmes of relevance to environmental health or to the working environment such as those of WHO and ILO, will add a new dimension to technical

co-operation and assistance in industrial development schemes. In some agricultural development projects executed in recent years with the co-operation of FAO, this philosophy has already been applied. While the underlying function of the UN system of organizations will remain the same, that is, to provide technical advice and information at every stage of the project, nevertheless modifications in the customary modes of procedure will be required. Many additional intellectual disciplines will need to be considered and appropriate specialists invited to contribute to the agencies' activities in technical co-operation. In some instances a greater degree of inter-agency co-ordination is to be expected.

K. Funding

240. Ongoing activities of the UN system in the field of Human Environment are funded within the established general framework of international budgeting, with Regular Programmes of individual organizations and the UNDP as the two main sources of finance.

241. Compared to other "horizontal" fields of work cutting across the UN system, the proportion of the respective allocations for environmental activities appear to place a higher burden on regular programmes mainly because of the high research component and the differentiation of advanced and developing countries with regard to the degree of their direct involvement in these activities. As a result a substantial part of the activities reviewed in this paper do not meet the criteria set for UNDP financing.

242. The potential capacity of the UN system to streamline and strengthen activities currently in progress and to launch new vigorous programmes in the field of Human Environment is necessarily dependent on the amount of financial resources earmarked for this purpose. No doubt, there is some room for a shift in emphasis and priorities, but it would be unrealistic to expect major breakthroughs without the allocation of new resources. It should be emphasized, however, that although development-oriented and environment-oriented activities should form part of the same planning process, any additional new resources provided for activities in the field of human environment should not be provided at the expense of resources available for development.

243. Of course, any world-wide programme will be necessarily based on the integration of national efforts and thus primarily draw on national resources. The impact and effectiveness of the programme, however, will, no doubt, largely depend on the strength of UN leadership and its means of impulse for setting a truly universal programme in motion.

## Chapter III

## SUMMARY AND CONCLUSIONS OF THE ACC CONSOLIDATED DOCUMENT ON THE UNITED NATIONS SYSTEM AND THE HUMAN ENVIRONMENT

244. In any consideration of future international action relating to the human environment, it would seem important to have a full picture of the action already being undertaken or planned. The Administrative Committee on Co-ordination, comprising the Secretary-General of the United Nations and the executive heads of the specialized agencies, has therefore prepared a consolidated document on the United Nations system and the human environment which attempts to give such a picture.

### A. The Consolidated ACC Document

245. The human environment is a wide-embracing term and there is an immense and complex range of international activities which have a direct or indirect bearing on it. It is difficult to cover these activities in a clear and comprehensive manner: the document tries to present them in a form that would be most convenient for the Stockholm Conference.

246. Thus, Chapter I provides information on the current activities of the United Nations system relating to the environment, arranged in accordance with the main agenda items of the Conference, namely the Planning and Management of Human Settlements for Environmental Quality: The Environmental Aspects of Natural Resources Management; Identification and Control of Pollutants of Broad International Significance; Educational, Informational and Cultural Aspects of Environmental Issues; and Development of Environment. There is an additional section on multi-disciplinary aspects of ongoing activities within the United Nations system.

247. Chapter II analyses the programmes of the United Nations family in relation to the main functions that appear necessary in dealing with the human environment, such as the collection and exchange of information; monitoring and surveillance; research; the establishment of scientific criteria, of policy guidelines and standards, and of institutions; the formulation of regional and international agreements; the development of technology; education and training; and funding. The Chapter outlines the approach taken, what is being done, and what is in an advanced stage of planning by the different organizations in each of these functional areas.

248. Annex I to the document provides a brief outline of the relevant work of each member of the UN family based on its constitutional responsibilities.

Annex II[1] contains a detailed compilation of the activities of each member in relation to the Stockholm agenda. The information given in these annexes supplements that given in Chapter I. Therefore, the ACC consolidated report could also be considered as a reference document. It lists activities by agenda items, by functions and by competence. This entails a great deal of repetition but this was thought to be preferable to excessive cross-referencing. While such a catalogue will, it is hoped, enable those interested to ascertain rapidly what is being done in any particular area and by whom, it might be helpful to have the conclusions in more handy form. This is the purpose of the present document.

## B. Conclusions

249. A number of conclusions emerge from the consolidated statement and these are outlined below.

250. The constitutional responsibilities of the organizations comprising the United Nations family cover many important areas and questions relating to the human environment. This is natural since the organizations have a general mandate to promote human welfare and more specific mandates in specialized fields such as health; labour and the well-being of workers; food and agriculture; education, science and culture; postal arrangements; meteorology; maritime affairs; atomic energy; telecommunications; industrialization; trade and development; housing; transport and natural resources; civil aviation.

251. A great many activities are being carried out relating to each major agenda item of the Stockholm Conference, and several, if not most, organizations have programmes in several, if not most, of these subject areas.

252. It should be said at once that this does not mean that all questions relating to the environment are being dealt with, or adequately dealt with. Indeed, not only are there a number of gaps and new ground to be broken, but many questions are receiving inadequate attention. The multi-disciplinary, integrated approach called for by so many environmental questions has so far been applied only in a limited number of instances. The consolidated document does not show, nor is it intended to imply, that everything that needs to be done is being done, or that what is being done is done in the best possible way.

253. As is pointed out in the Introduction to the consolidated document, most United Nations organizations have been established on the sectoral pattern, reflecting the

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[1] Available in the Conference library.

structure of national governments with separate departments for agriculture, health, labour, education, and so on. Each organization has been led, in the normal course of its history and by decisions of its Member States, to undertake activities relating to the environment in its own particular sector, since many environmental problems have an international dimension arising from their geographical scope, their universality, or their consequences for the future of mankind as a whole.

254. The sectoral approach remains valid for a large number of problems, which can be dealt with essentially from one specialized point of view. Thus, the problem of aircraft noise can be covered mainly by the organization responsible for civil aviation; problems of the working environment by the organization responsible for labour; etc. In dealing with such problems, the organization mainly concerned sometimes requires advice and support from another organization on a particular aspect. This type of co-operation is taking place in the United Nations system to an extent which is, perhaps, not fully appreciated. There is an increasing variety of problems, however, that require an integrated or "horizontal" approach. These call for wider and more elaborate co-operative arrangements by organizations which are essentially sectoral or "vertical".

255. It should be emphasized at this point that the success of any attempt to tackle a particular environmental problem globally, through a multi-disciplinary approach, is a matter essentially for decision by Member States. Most action must, in fact, be taken nationally, and international action ultimately depends largely on action at the national level. What international organizations can do to foster and assist the efforts of Governments must also depend on agreement on general policies in the legislative organs of the organizations of the United Nations system. These are essential both to collective action and to coherent assistance to individual States in particular cases.

256. Agencies are often called on by Governments to deal with similar problems but from different points of view, and it has been the task of the co-ordination machinery to try and ensure that there is no overlapping or waste. The ACC provides a framework at the inter-secretariat level for co-ordination and co-operation for the United Nations system. This machinery is flexible and a variety of means have been evolved in response to varying needs. The ACC has established ad hoc functional groups of executive heads, such as the Functional Group on the Human Environment which prepared the consolidated document. In addition it has a wide range of subsidiaries which deal with many facets of the environment. There are joint committees and working groups - both inter-

governmental and inter-secretariat; there is joint execution of projects, and there are inter-agency programmes. There has, in recent years, been an increasing trend towards dealing with large issues through joint, integrated programmes. Examples of this are provided by the Second Development Decade and work in the field of population, partially supported by the United Nations Fund for Population Activities. The UNESCO programmes on the International Hydrological Decade, on Man and the Biosphere and the work of the Inter-governmental Oceanographic Commission attempt to co-ordinate both interdisciplinary and international research. Agroclimatological surveys are carried out in co-operation among FAO, UNESCO and WMO. The Joint Group of Experts on the Scientific Aspects of Marine Pollution represents the co-operative efforts of United Nations, FAO, IAEA, IMCO, WHO and WMO. Examples of such co-operative programmes are found not only in the area of research but also in operational activities financed under UNDP.

257. Once again, the consolidated document is not intended to imply that arrangements for co-operation work perfectly in all cases, or that no difficulties ever arise. But it can fairly be said that, considering the complexity and variety of questions that are handled by them, they provide an effective and dynamic mechanism.

258. The major emphasis of the activities of the United Nations system is on development, reflecting national priorities. However, as has been frequently pointed out, it is of great importance that development-oriented and environment-oriented activities be integrated as parts of the time planning process. It is essential for example to harmonize activities dealing with the conservation of natural resources and those dealing with their use. The ACC in its statement to the Economic and Social Council in July 1969[1], in fact urged members of the United Nations system to adopt "as far as possible an ecological and integrated approach in their activities relating to utilization of resources and environmental management".

259. There are important gaps in the present pattern of activities and certain functions are not being carried out. For example, there are important areas in which research is needed, such as the health effects of environmental contaminants, or the development of technology for abatement of pollution and for environmental quality

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[1] See document E/4710.

control. There are several international information exchange and monitoring programmes, some of which are unable to accomplish more than a small part of the task. Data, accumulated by national centres is often not made available to other countries. While each organization is collecting information in its own particular sphere, there is a need for arrangements to direct inquiries to the appropriate source. There is at present not enough technical assistance being provided to help governments in shaping realistic environmental policies consonant with development.

260. The Stockholm Conference will doubtless take a number of decisions, perhaps in the form of an overall plan of action, designed to fill the gaps that exist and to provide a coherent global framework for environmental action. The United Nations system was not designed specifically to undertake this task: indeed it was not designed specifically for many of the tasks that it now regularly and effectively undertakes. New responsibilities do not automatically require new institutions and mechanisms, but do mean an adaptation of existing mechanisms and arrangements. Thus, after Stockholm the ACC would consider what adjustments in the arrangements for inter-agency co-operation are necessary, while the organizations could individually review the need for any changes in internal structure. As the ACC said in its statement of July 1969 [1/], the "complexity and magnitude of the problems of the human environment and their inter-disciplinary nature call for even more effective inter-agency co-operation".

261. Thus, it is seen that the institutions, the experience and a large measure of expertise needed, exist. The past quarter century has shown that the machinery can be adapted when necessary to assume the implementation of inter-governmental decisions and to facilitate the provision of technical assistance on environmental matters.

## C. Summary

262. In summary, the ACC submits the following considerations:

(1) The organizations of the United Nations system has constitutional responsibilities in large areas of the human environment;

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[1/] see document E/4710

(2) They are undertaking and planning a wide range of activities concerned with the human environment;

(3) The United Nations system has focussed primarily on development. In many cases, environmental issues are facets of development, and the two should not be separated either in concept or in practice;

(4) There are important issues which are not at present covered, or are not covered adequately. In particular, there is a need for an integrated approach to many questions of the environment;

(5) The United Nations system of organizations has been built up essentially on a sectoral pattern. Through the ACC it has machinery and arrangements for inter-secretariat co-ordination and co-operation, developed and tempered over the past quarter century. The ACC not only provides facilities for co-ordination of sectoral activities, but provides an inter-secretariat framework for an integrated and coherent approach to large general problems;

(6) A multi-disciplinary, international approach to environmental questions depends essentially on the political will and decisions of Member States;

(7) The United Nations system has institutions, experience and machinery which can be adapted to new tasks and needs. These are at the service of the world community to carry out any inter-governmental decisions resulting from the Stockholm Conference.

## Annex I

## INTRODUCTION

The following statements summarize the work of the various bodies and organizations of the United Nations system in relation to the human environment as expressed in their own words.

## UNITED NATIONS

The Office for Science and Technology of the Department of Economic and Social Affairs - provides the focal point in the United Nations system for general matters relating to the application of science and technology to development; it serves as the Secretariat for the United Nations Advisory Committee on the Application of Science and Technology to Development (ACAST), the ACC Sub-Committee on Science and Technology and the newly created Standing Committee on Science and Technology of the Economic and Social Council, and was responsible for the preliminary organizational work for the Stockholm Conference until the establishment of this Conference's Secretariat.

The Resources and Transport Division of the Department of Economic and Social Affairs - is the central unit in the fields of water, energy, mining, surveying and mapping, marine resources and transport, and it carries out a number of operational and non-operational activities directly or indirectly related to the human environment in these fields. The Division provides the substantive servicing in its fields of the General Assembly and ECOSOC and their subsidiary bodies, notably the standing Committee on Natural Resources, as well as the extensive field operations entrusted to the United Nations in resources and transport development. The Division is playing a vital role in the preparations for the Stockholm Conference, inter alia, with the submission of 18 "basic papers" and servicing of the intergovernmental Working Group on Marine Pollution.

The Centre for Housing, Building and Planning of the Department of Economic and Social Affairs - plays a major role in the formulation and co-ordination of the United Nations programmes and projects related to human settlements. It is analysing the trends and consequences resulting from social and economic changes and urbanization, it prepares special studies and guidelines on policy issues, methodologies of comprehensive planning and implementation, finance, technical, managerial and legislative questions. It undertakes and promotes research and provides advice to governments on regional, urban and rural planning as well as on housing and building.

The ECONOMIC COMMISSION FOR EUROPE (ECE) - is carrying out a programme of research and study on the socio-economic aspects of environmental problems which embraces both on sectoral and intersectoral approach. Under ECE's auspices permanent inter-governmental machinery has been established to deal with environmental policies, strategies, institutional and legislative measures, planning techniques, etc., water management, including water pollution; housing, transport and urban development; agriculture and forestry; energy; and different industrial branches. The ECE organizes seminars, expert working parties and study tours in these fields of work.

The UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT (UNCTAD) - is conducting studies on the foreign trade implication of environment measures. Environmental issues are going to exercise a growing influence on international economic relations. They are not only a formidable competitor for development resources but they are also a factor which is going to influence the pattern of world trade, the international location of industries and the competitive position of different groups of countries. Environmental actions by developed countries are going to have a profound and manyfold impact on the growth and external economic relations of developing countries. The UNCTAD studies aim to investigate these processes with special reference to the possible growth of tariff and non-tariff barriers, to shifts in primary commodity markets, to the impact of recycling on trade and to new relationships between synthetic and natural products.

The UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION (UNIDO) - is concerned with the environmental problems of direct industrial origin. UNIDO supports the development and transfer of suitable processes and technologies for minimizing harmful gazeous, solid and liquid emissions and for recovering valuable materials from wastes and pollutants.

UNIDO supports the establishment of appropriate policies for industry comprising provisions against over-concentration of polluting industries as well as guidelines and measures to prevent and resolve environmental conflicts.

UNIDO provides guidance to governments on the legal and institutional aspects of environmental management ensuring at the same time that the criteria and standards to be adopted are within the techno-economic possibilities of the industrial sector.

UNIDO studies the economics of environmental quality and its implications for the development of the industrial sector. It gives support to the introduction of environmental criteria in the preparation and implementation of industrial projects and industrial development plans.

The UNITED NATIONS CHILDREN'S FUND (UNICEF) - is assisting Governments in some 110 countries in the development of services for children and adolescents in the areas of health and environmental sanitation, education and human resources, nutrition, and welfare services and institutions. Particular emphasis is placed on community action and services at the level of the community.

The UNITED NATIONS INSTITUTE FOR TRAINING AND RESEARCH (UNITAR) - intends to continue and to expand moderately its environment-related activities in accordance with its overall mission of seeking to improve the effectiveness of the United Nations system. Environment-related topics will be incorporated into a number of UNITAR's training activities, and special environment training activities will be held from time to time as appropriate. In research, UNITAR's environment activities will continue to form part of its effort in the area of "the implications of science and technology for international organizations", with the major emphasis being placed on the design of remedial policies in respect of environmental problems of international significance.

The WORLD FOOD PROGRAMME (WFP) - provides assistance for development projects and emergency operations, almost all of which have human environment impact. Most of the aid is given as the only material incentive to participate in such selfhelp schemes other than the personal incentive to enjoy better homes, cleaner, healthier more sanitary and more up-to-date facilities, amenities and surroundings. These can include countrywide disease eradication (e.g. malaria control), the construction of better schools and healthier centres and other public buildings, the replacement of unsightly and unhealthy slums by pleasant parks and rehousing of the inhabitants, often squatters, in new urban areas within reach of remunerative employment.

## SPECIALIZED AGENCIES

The INTERNATIONAL LABOUR ORGANIZATION (ILO) - is concerned with workers and with their living and working conditions in the widest sense. Of particular concern are the physical conditions of the work place - the working environment. The safety, health and well-being of workers whether in factories, mines, fields or offices, are primary subjects for ILO action. However, other aspects relevant to the workers' environment are also covered by the ILO, such as job satisfaction, the fitting of work to the human being, housing, recreation facilities and the use of leisure. Through its educational programmes for management and workers, the ILO can promote the protection of the human environment. Above all, it is noteworthy that the ILO is a tripartite organization associating employers and workers on a footing of equality with government representatives in all aspects of its work, including that related to the environment in which the worker lives and works.

The FOOD AND AGRICULTURE ORGANIZATION (FAO) - by its Constitution is entrusted with the responsibility of improving living conditions of rural populations and the conservation of natural resources, while promoting the development of agriculture, forestry and fisheries. The organization is particularly involved in operational activities aiming at:

(a) a proper assessment of the potentialities and limitations for use of soils, crops, livestock, grazing lands, forests, wildlife and fish resources;

(b) the protection of these resources against degradation hazards, risks of depletion, pollution, diseases and pests by promoting sound planning and management practices through applied research, demonstration and training and by assisting in developing adequate legislation, standards, institutions and regulatory controls;

(c) the reduction of all forms of wastage in the process of food and agriculture production including those wastes which are harmful to these activities, to the quality of food and other agricultural products, and to the human environment in general;

(d) and thereby maintaining and improving the quality of the rural and aquatic sectors of the human environment.

The UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION (Unesco). Almost since its creation Unesco has been concerned with environmental issues. From the founding of the International Union for the Conservation of Nature in 1948 to the launching in 1971 of the long-term intergovernmental and interdisciplinary research programme on Man and the Biosphere, Unesco has conducted and stimulated, in co-operation with other interested organizations, important activities related to the scientific problems of the environment. Major landmarks in this respect have been made by the multidisciplinary programmes on Arid Zone Research, on Humid Tropics Research, the establishment of the Intergovernmental Oceanographic Commission and the launching of the International Hydrological Decade. The natural sciences approach to the environment is however only part of the more general effort made by this Organization in the environmental field in relation to its commitment to education, social sciences, culture and information as well as to science. Recent trends in the Organization's programme reflect a multidisciplinary development of activities in these various sectors, including promotion of environmental education, protection of monuments and sites of universal value, studies of social and behavioural factors, etc... with the major emphasis remaining in the natural sciences. The Executive Board of Unesco has confirmed this general orientation in October 1971 (88 EX. Decision 4.2.2.).

The WORLD HEALTH ORGANIZATION (WHO) - by the terms of its constitution is required to work towards securing the protection of human health from adverse environmental factors, future as well as present. The Twenty-Fourth World Health Assembly (May,1971) has directed WHO to take certain actions designed to maintain and strengthen this role, in particular:

(a) to improve environmental health and sanitation in all countries and notably developing countries, with special emphasis on the provision of adequate quantities of potable water and the sanitary disposal of wastes;

(b) to establish and to promote international agreement on criteria, guides and codes of practice with respect to known environmental influences on health, with particular emphasis on occupation exposure, and water, food, air and waste, and to obtain further information on levels and trends on these;

(c) to stimulate the development and co-ordination of epidemiological health surveillance by methods including environmental monitoring systems, in collaboration with other national and international efforts, in order to provide basic information on actual and suspected adverse effects on human health attributable to the environment;

(d) to extend the knowledge of effects of environmental factors on human health by collection and dissemination of information, stimulation, support and co-ordination of research, and assisting in the training of personnel.

"The International Agency for Research on Cancer (IARC) was created by the World Health Assembly in 1965. Much of its research programme has been concentrated upon the identification and measurement of environmental carcinogens."

In 1970, the INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT (IBRD) announced that it was taking steps to ensure that projects receiving bank group financing would "... not have seriously adverse ecological consequences or, if they are likely to have such consequences that measures are taken to avoid or mitigate them". An Office of the Environmental Adviser was established and commenced operations toward the end of the year. The current activities of this office include:

(a) examination of projects under preparation for bank group financing with a view to detecting and identifying their impact on the human environment, and on the health and well-being of peoples affected by their presence or operation, and recommending relevant remedies where necessary;

(b) developing means to institutionalize environmental and related health/socio-cultural considerations as a routine aspect of project development within the bank group, including preparation of appropriate environment/health checklists relevant to several sectors of the bank group activities; and

(c) co-ordination of policies and practices in this area within the bank group and with other multilateral and bilateral lending institutions.

In addition to conducting the necessary studies to identify the nature and scope of environmental problems and providing for their prevention or mitigation, the Office of the Environmental Advsier also provides surveillance over on-going projects to assess the adequacy of environmental and health protection measures. It also assists borrowers and Member countries in their efforts to better understand environmental problems and their correction.

Some ancillary activities have included: consulting with the governments of Member countries, at their request, on environmental matters and on ways and means to develop appropriate curricula and training for environmental disciplines; co-operating with United Nations agencies and others in the development of methodologies for identifying and quantifying social costs attributable to development projects; and establishing necessary operational linkages with international bodies important in the bank group's environmental endeavours.

The INTERNATIONAL CIVIL AVIATION ORGANIZATION (ICAO) - is doing research on the effects of aircraft noise and the degree to which the population is affected; this applies to both the noise in the vicinity of airports and to the sonic boom of future commercial supersonic aircraft. An annex (No. 16) to the Convention on International Civil Aviation has recently been developed and published by ICAO. It contains international standards and recommended practices related to aircraft noise certification, noise measurement and noise abatement operating procedures.

The WORLD METEOROLOGICAL ORGANIZATION (WMO) - by virtue of its Convention, is responsible for facilitating world-wide co-operation in the establishment of a network of stations to conduct meteorological observations or other geophysical observations related to meteorology. It is responsible for promoting the establishment and maintenance of a system for rapid exchange of information between these stations. It is obvious that, with these responsibilities and with its observation systems already in operation, WMO has an important role to play in global monitoring of the human environment.

WMO also furthers the application of meteorology to appropriate human activities and in this context is charged with all environmental problems in which atmospheric phenomena directly or indirectly play a significant role.

By virtue of its responsibility to encourage research and training in meteorology, the organization is involved in various research projects of importance for studies of changes in the earth's global and local climates and is endeavouring to improve training in the environmental aspects of meteorology.

The INTERGOVERNMENTAL MARITIME CONSULTATIVE ORGANIZATION (IMCO) - is responsible for the safety of ships and for preventing pollution of the land, sea or air, by or from ships, vessels and other equipment operating in the marine environment. It is the depository organization for the International Convention for the Prevention of Pollution of the Sea by Oil, the International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, and the International Convention on Civil Liability for Oil Pollution Damage. Additionally IMCO has issued and continues to prepare internationally agreed recommendations to Governments on the safety of navigation, the prevention of marine pollution and methods of dealing with spillages, including the carriage of oil and other noxious and hazardous cargoes.

## OTHER ORGANIZATIONS

The INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA) - is directed by its statute to establish or adopt standards of safety for protection of health and minimization of danger to life and property from the peaceful uses of atomic energy. In carrying out this function the agency has programmes on the management of radioactive wastes, transport of radioactive materials and siting and design of nuclear facilities to assure that human health and the environment are not seriously impaired due to nuclear activities. The agency, in close co-operation with FAO, promotes the application of nuclear techniques in developing efficient use of fertilizers and water, investigating the fate of pesticides in food and the environment and in the development of sterile male techniques for pest control.

The GENERAL AGREEMENT ON TARIFFS AND TRADE (GATT) - is a multilateral treaty on trade embodying reciprocal rights and obligations as well as containing procedures for consultation and negotiation. Seventy-eight countries adhere to GATT representing over eighty per cent of world trade. Since effective pollution control measures will have economic consequences which will often affect trade, it is urgent to avoid situations in which the institution of national pollution control systems would interfere with the continued expansion of international trade. GATT's efforts will be directed to ensuring that measures to protect and enhance the environment are not used as instruments for protective trade policies.

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Conférence des Nations Unies sur l'environnement
Conferencia de las Naciones Unidas sobre el medio humano
**Конференция Организации Объединенных Наций по окружающей человека среде**

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# Bibliography
# Bibliographie
# Bibliografía
# **Библиография**

only one earth | une seule terre | una sola tierra | только одна земля

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CONFERENCE ON THE HUMAN ENVIRONMENT
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Note: Part two of this bibliography, which will list selected documents issued in connection with meetings held in preparation for the Conference, will be issued as document A/CONF.48/13/Add.1.

# INTRODUCTION

1. This bibliography is a first list of the documents which will be available in the Conference library which is to be set up at Stockholm for consultation by participants in the Conference. The contents of the Conference library, while not being official Conference documents, will include the bulk of the source material from which the Conference documents were drawn.

2. The bibliography is divided into two parts. The first part (contained in the present document) lists the national reports, case studies and other basic documents received from governments by the Conference secretariat and the basic documents received from members of the United Nations system and other sources, intergovernmental and non-governmental. It should be noted that the basic documents listed are those which have been specially prepared in connexion with the secretariat's preparations for the Conference.[1] These documents have not hitherto been accessible outside the Conference secretariat.

3. The Conference secretariat has also received numerous background documents, not specially prepared for the Conference, which have also been drawn upon in the preparation of Conference documents. However, papers in the latter category have not been listed in this bibliography and will not be included in the Conference library at Stockholm. Further information on these background documents may be obtained from the Conference secretariat.

4. The second part of the bibliography (to be issued as an addendum to the present document) will list selected documents issued in connexion with meetings held in preparation for the Conference. These documents have already been made available to participants at those meetings, but have not hitherto been assembled under one cover.

5. The bibliography has been prepared in a single version in three languages: English, French and Spanish. Headings, sub-headings, footnotes and, where appropriate and possible, names of sources are given in those three languages. The title of each document and information concerning authorship and date are given in the language of

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[1] When a basic document has been revised, only the revised version is listed.

the original provided it is one of the three languages; if it is not in one of those languages, a translation into one is provided. The abbreviations "E" for English, "F" for French and "S" for Spanish are used to indicate these three languages, in one or other of which nearly all the documents were submitted.

6. The entries under each heading of this bibliography are listed according to the English alphabetical order of the source of the document. Each document has a serial number for easy reference.

7. In the case of basic documents relating to specific subject areas, the principal subject areas in question are indicated in the last column by the appropriate Roman numeral[1]. In cases where the scope of a document is not limited to one or two subject areas, this is indicated by the abbreviation "Gen.", which stands for "General". No indication of subject area is given for national reports since, by definition, they cover the whole range of environmental problems.

8. Addenda will be issued to this bibliography as necessary to bring it up to date.

9. The basic documents listed in Part One of this bibliography comprise 348 documents totalling some 12,000 pages as follows:

| - from Governments: | | | Documents | Pages |
|---|---|---|---|---|
| National reports | (1.1.1 - 1.1.77) | : | 77 | 3,586 |
| Case studies | (1.2.1 - 1.2.31) | : | 31 | 1,460 |
| Other documents | (1.3.1 - 1.3.30) | : | 30 | 787 |
| Total from Governments | | | 138 | 5,833 |

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[1] Subject area I : Human settlements
" " II : Natural resources
" " III : Pollutants
" " IV : Educational, informational, social and cultural aspects
" " V : Development and environment
" " VI : International organizational implications

It should be noted that a number of topics listed for consideration under one subject area in the report of the Preparatory Committee on its second session (A/CONF.48/PC/9, para. 20) have in fact been treated in the Conference documents on other subject areas. Thus, for example, topic "III(c)(iii) - Land" is covered in the recommendations on subject area II. In such cases, while the basic documents submitted may refer to the subject area under which the relevant topics were originally located, the annotations in this bibliography refer to the subject areas in which the topics were actually treated.

| | | Documents | Pages |
|---|---|---|---|
| - from United Nations system | | | |
| United Nations bodies | (2.1 - 2.40) : | 40 | 1,967 |
| Agencies and IAEA | (3.1 - 3.86) : | 86 | 1,273 |
| Total from United Nations system | | 126 | 3,240 |
| - from other sources | | | |
| Intergovernmental organizations | (4.1 - 4.13) : | 13 | 285 |
| International non-governmental organizations | (5.1 - 5.47) : | 47 | 818 |
| National organizations etc. | (6.1 - 6.16) : | 16 | 1,235 |
| Total from other sources | | 76 | 2,338 |
| - draft position papers | (7.1 - 7.8) : | 8 | 596 |
| GRAND TOTAL | | 348 | 12,007 |

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Stockholm, 5-16 juin 1972

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Note : La deuxième partie de la présente bibliographie groupant les titres de certains documents publiés à l'occasion de réunions tenues en vue de préparer la Conférence, sera publiée sous la cote A/CONF.48/13/Add.1.

# INTRODUCTION

1. La présente bibliographie est une première liste des documents qui constitueront la bibliothèque de la Conférence à Stockholm et que les participants à la Conférence pourront consulter. La bibliothèque de la Conférence ne contiendra pas les documents officiels de la Conférence, mais elle réunira la plus grande partie de la documentation à partir de laquelle ces documents ont été élaborés.

2. La bibliographie est divisée en deux parties. La première (qui constitue le présent document) énumère les rapports nationaux, monographies et autres documents de base communiqués par les gouvernements au secrétariat de la Conférence, ainsi que les documents de base soumis par des organismes des Nations Unies et d'autres sources, intergouvernementales et non gouvernementales. Il convient de noter que les documents de base énumérés sont ceux qui ont été rédigés spécialement dans le cadre des travaux préparatoires du secrétariat en vue de la Conférence 1/. Jusqu'à présent, seul le secrétariat de la Conférence avait eu accès à ces documents.

3. Le secrétariat de la Conférence a également reçu de nombreux documents de caractère général qui n'avaient pas été préparés spécialement pour la Conférence mais qui ont également servi à élaborer les documents de la Conférence. Toutefois, les documents de cette dernière catégorie ne sont pas mentionnés dans la présente bibliographie et on ne les trouvera pas dans la bibliothèque de la Conférence à Stockholm. Le secrétariat de la Conférence pourra fournir sur demande de plus amples renseignements sur ces documents généraux.

4. La deuxième partie de la bibliographie (qui sera publiée en tant qu'additif au présent document) comprendra une liste de certains documents publiés à l'occasion de réunions tenues en vue de préparer la Conférence. Ces documents ont déjà été mis à la disposition des participants aux réunions en question, mais jusqu'à présent ils n'avaient pas encore été réportoriés.

5. La première partie de la bibliographie a été préparée en une seule version en trois langues : anglais, français et espagnol. Les rubriques, sous-rubriques, notes de bas de page et, lorsque les circonstances le justifient et le permettent, les indications de source sont présentées dans ces trois langues. Le titre de chaque document et les renseignements concernant l'auteur et la date sont donnés dans la langue de l'original à condition qu'il s'agisse d'une des trois langues mentionnées ci-dessus; si ce n'est pas le cas, une traduction dans l'une de ces langues est fournie. Les abréviations "E" pour l'anglais, "F" pour le français et "S" pour l'espagnol sont utilisées pour désigner ces trois langues; la plupart des documents ont été soumis dans l'une ou l'autre de ces langues.

6. Les ouvrages énumérés sous chaque rubrique de cette bibliographie sont classés dans l'ordre alphabétique anglais de la source du document. Pour plus de commodité, on a affecté à chaque document un indicatif chiffré.

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1/ Lorsqu'un document de base a été revisé, seule la version revisée est mentionnée.

7. Dans le cas des documents de base se rapportant à des thèmes précis, le thème principal du document est indiqué dans la dernière colonne par le chiffre romain approprié [1]. Lorsqu'un document porte sur plus d'un ou deux thèmes, il est suivi de l'abréviation "Gen.", qui signifie "General". Il n'y a pas d'indication du thème principal dans le cas des rapports nationaux, qui par définition portent sur l'ensemble des problèmes d'environnement.

8. Des additifs à la présente bibliographie seront publiés, selon les besoins, pour la mettre à jour.

9. Les documents de base énumérés dans la première partie de la présente bibliographie sont au nombre de 348 et représentent au total quelque 12 000 pages; ils se répartissent comme suit :

| | Documents | Pages |
|---|---|---|
| - communiqués par les gouvernements : | | |
| Rapports nationaux (1.1.1 - 1.1.77) : | 77 | 3 586 |
| Monographies (1.2.1 - 1.2.31) : | 31 | 1 460 |
| Autres documents (1.3.1 - 1.3.30) : | 30 | 787 |
| Total, gouvernements | 138 | 5 833 |
| - communiqués par les organismes des Nations Unies : | | |
| Organes des Nations Unies (2.1 - 2.40) : | 40 | 1 967 |
| Institutions spécialisées et AIEA (3.1 - 3.86) : | 86 | 1 273 |
| Total, organismes des Nations Unies | 126 | 3 240 |
| - communiqués par d'autres sources : | | |
| Organisations intergouvernementales (4.1 - 4.13) : | 13 | 285 |
| Organisations non gouvernementales internationales (5.1 - 5.47) : | 47 | 818 |
| Organisations nationales, etc. (6.1 - 6.16) : | 16 | 1 235 |
| Total, autres sources | 76 | 2 338 |
| - projets de rapports de situation (7.1 - 7.8) : | 8 | 596 |
| TOTAL GENERAL | 348 | 12 007 |

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[1] Thème I : Etablissements humains
" II : Ressources naturelles
" III : Polluants
" IV : Aspects éducatifs, sociaux et culturels et question de l'information
" V : Développement et environnement
" VI : Incidences internationales sur le plan de l'organisation

Il convient de noter qu'un certain nombre de sujets qui étaient rattachés à tel ou tel thème dans le rapport du Comité préparatoire sur sa deuxième session (A/CONF.48/PC/9, par.20) ont en fait été abordés dans des documents de la Conférence concernant d'autres thèmes. Ainsi, le sujet "III c) iii) - Terres" est visé par les recommandations concernant le thème II. En pareil cas, même si les documents de base soumis se réfèrent au thème dont les sujets en question relevaient à l'origine, les annotations données dans la présente bibliographie concernent les thèmes à propos desquels ces sujets ont été effectivement traités.

NACIONES UNIDAS

# ASAMBLEA GENERAL

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22 de febrero de 1972

ESPAÑOL
Original: INGLES/FRANCES
ESPAÑOL/RUSO

CONFERENCIA SOBRE EL MEDIO HUMANO
Estocolmo, 5 a 16 de junio de 1972

## BIBLIOGRAFIA DE LA CONFERENCIA

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Nota: La segunda parte de esta bibliografía, que contendrá la lista de determinados documentos publicados en relación con las reuniones preparatorias de la Conferencia, se publicará con la signatura A/CONF.48/13/Add.1.

## INTRODUCCION

1. Esta bibliografía contiene una primera lista de los documentos que habrá en la biblioteca de la Conferencia, que va a funcionar en Estocolmo, para su consulta por los participantes. Las obras que componen la biblioteca de la Conferencia, aunque no son documentos oficiales de ésta, comprenden el grueso de la documentación consultada para preparar los documentos de la Conferencia.

2. La bibliografía se compone de dos partes. En la primera (contenida en el presente documento) se enumeran los informes nacionales, monografías y otros documentos básicos recibidos de los gobiernos por la secretaría de la Conferencia, así como los documentos básicos procedentes de las organizaciones del sistema de las Naciones Unidas y de otras fuentes, intergubernamentales y no gubernamentales. Ha de señalarse que los documentos básicos enumerados son los que se han preparado especialmente en relación con la organización por la secretaría de la Conferencia 1/. Hasta ahora sólo ha tenido acceso a tales documentos la secretaría de la Conferencia.

3. La secretaría de la Conferencia ha recibido asimismo gran número de documentos informativos, no preparados especialmente para la Conferencia, que se han utilizado también en la preparación de los documentos de la Conferencia. Los documentos de esta última categoría no se relacionan, sin embargo, en esta bibliografía ni formarán parte de la biblioteca de la Conferencia en Estocolmo. La secretaría de la Conferencia podrá facilitar más detalles sobre estos documentos informativos.

4. En la segunda parte de la bibliografía (que aparecerá como adición al presente documento) se enumerarán determinados documentos publicados en relación con las reuniones preparatorias de la Conferencia. Esa documentación ya se ha puesto a disposición de los participantes en tales reuniones, pero hasta ahora no se había compilado.

5. Se ha preparado una versión única de la primera parte de la bibliografía en tres idiomas: español, francés e inglés. Los epígrafes y subepígrafes y notas de pie de página se dan en esos tres idiomas, así como también, cuando es oportuno, los nombres de las fuentes. El título de cada documento, la información relativa a los autores y la fecha se dan en el idioma original, siempre que se trate de uno de los tres idiomas mencionados; de lo contrario se facilita la traducción a uno de esos idiomas. Para indicar esos idiomas se utilizan las letras "E" para el inglés", "F" para el francés y "S" para el español, en uno u otro de los cuales se han presentado casi todos los documentos.

6. Los documentos comprendidos en cada epígrafe de esta bibliografía se enumeran siguiendo el orden alfabético inglés de su fuente. Para facilitar la consulta, cada uno de ellos lleva un número de serie.

7. En el caso de los documentos básicos sobre una materia concreta de estudio, la materia principal de que se trata se indica en la última columna con el número romano

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1/ Cuando un documento básico ha sido revisado, sólo se menciona la versión revisada.

correspondiente[1]. Cuando un documento no se limite a una o dos materias de estudio, ello se indica con la abreviatura "Gen.", es decir, "General". No se especifica la materia de estudio de los informes nacionales pues, por definición, éstos abarcan todos los problemas del medio.

8. Para poner al día la presente bibliografía se distribuirán las adiciones necesarias.

9. La primera parte de esta bibliografía comprende 348 documentos, con un total de 12.000 páginas, distribuidas como sigue:

| | Documentos | Páginas |
|---|---|---|
| - recibidos de los gobiernos: | | |
| Informes nacionales (1.1.1 - 1.1.77): | 77 | 3.586 |
| Monografías (1.2.1 - 1.2.31): | 31 | 1.460 |
| Otros documentos (1.3.1 - 1.3.30): | 30 | 787 |
| Total de documentos recibidos de los gobiernos | 138 | 5.833 |
| - de organizaciones del sistema de las Naciones Unidas | | |
| Organos de las Naciones Unidas (2.1 - 2.40) | 40 | 1.967 |
| Organismos especializados y OIEA (3.1 - 3.86): | 86 | 1.273 |
| Total de documentos procedentes del sistema de las Naciones Unidas | 126 | 3.240 |
| - de otras fuentes | | |
| Organizaciones intergubernamentales (4.1 - 4.13): | 13 | 285 |
| Organizaciones internacionales no gubernamentales (5.1 - 5.47): | 47 | 818 |
| Organizaciones nacionales, etc. (6.1 - 6.16): | 16 | 1.235 |
| Total otras fuentes | 76 | 2.338 |
| - proyectos de documentos de posición (7.1 - 7.8) | 8 | 596 |
| TOTAL GENERAL | 348 | 12.007 |

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[1] Materia de estudio I: Asentamientos humanos
" " II: Recursos naturales
" " III: Agentes contaminantes
" " IV: Aspectos educacionales, informativos, sociales y culturales
" " V: El desarrollo y el medio
" " VI: Consecuencias institucionales en el plano internacional.

Se observará que algunos de los asuntos enumerados para su examen en relación con una materia de estudio en el informe de la Comisión Preparatoria sobre su segundo período de sesiones (A/CONF.48/PC/9, párr. 20) han pasado de hecho a formar parte de otras materias de estudio en los documentos de la Conferencia. Así por ejemplo, el asunto "III c) iii) - Tierras" figura en las recomendaciones sobre la materia de estudio II. En tales casos, aunque los documentos básicos presentados se refieren a la materia de estudio que agrupaba en un principio el asunto correspondiente, las anotaciones de esta bibliografía se refieren a las materias de estudio en que realmente se han tratado.

ОБЪЕДИНЕННЫЕ НАЦИИ

ГЕНЕРАЛЬНАЯ
АССАМБЛЕЯ

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КОНФЕРЕНЦИЯ ОРГАНИЗАЦИИ ОБЪЕДИНЕННЫХ НАЦИЙ
ПО ПРОБЛЕМАМ ОКРУЖАЮЩЕЙ ЧЕЛОВЕКА СРЕДЫ

Стокгольм, 5-16 июня 1972 г.

# БИБЛИОГРАФИЯ МАТЕРИАЛОВ КОНФЕРЕНЦИИ

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Примечание: Часть вторая этой библиографии, в которой будут перечисляться отдельные документы, изданные в связи с совещаниями, состоявшимися в ходе подготовки к Конференции, будет издана в качестве документа A/CONF.48/13/Add.1.

## ВВЕДЕНИЕ

1. Эта библиография является первым списком документов, которые можно будет получить в библиотеке Конференции, создаваемой в Стокгольме для консультации участников Конференции. Документы библиотеки Конференции, которые хотя и не являются официальными документами Конференции, будут включать основные материалы источников, на основе которых были подготовлены документы Конференции.

2. Эта библиография делится на две части. В первой части (содержащейся в настоящем документе) перечисляются национальные доклады, монографии и другие основные документы, полученные секретариатом Конференции от правительств, и основные документы, полученные от членов системы Организации Объединенных Наций и из других источников, как межправительственных, так и неправительственных. Следует отметить, что основными перечисленными документами являются документы, которые были подготовлены специально в связи с подготовкой секретариата к Конференции[1]. В связи с этим эти документы можно было получить только в секретариате Конференции.

3. Секретариат Конференции получил также многочисленные исходные документы, не подготовленные специально для Конференции, которые также были составлены в ходе подготовки документов Конференции. Однако документы этой последней категории не перечислялись в этой библиографии и не будут включены в библиотеку Конференции в Стокгольме. Дальнейшая информация об этих исходных документах может быть получена в секретариате Конференции.

4. Во второй части библиографии (которая должна быть издана в качестве добавления к настоящему документу) содержится список отдельных документов, изданных в связи с совещаниями, проведенными в ходе подготовки Конференции. Эти документы уже предоставлялись в распоряжение участников на этих совещаниях, но не были собраны в одном месте.

5. Первая часть библиографии была подготовлена в одном варианте на трех языках: английском, французском и испанском. Заголовки, подзаголовки, примечания и, где необходимо и возможно, названия источников приводятся на этих трех языках. Название каждого документа и информация, касающаяся авторства, и даты приводятся на языке оригинала, при условии, что он является одним из трех языков; если он не является одним из трех языков, то дается перевод на один из языков. Сокращения "E" для английского языка, "F" для французского языка и "S" для испанского языка используются для указания этих трех языков, на том или ином из которых были представлены почти все документы.

6. Названия под каждым заголовком этой библиографии приводятся в соответствии с английским алфавитом источника документа. Для удобства каждый документ имеет порядковый номер.

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[1] В том случае, когда основной документ был пересмотрен, указывается только пересмотренный вариант.

7. Что касается основных документов, относящихся к специфическим тематическим разделам, то основной рассматриваемый тематический раздел указывается в последней графе соответствующей римской цифрой[1]. В тех случаях, когда охват документа не ограничивается одним или двумя тематическими разделами, это указывается сокращением "Gen.", что означает "общий". Для национальных докладов не дается указания темы, поскольку по определению они охватывают весь диапазон проблем окружающей среды.

8. По мере необходимости, к этой библиографии будут выпущены дополнения в целях обновления данных.

9. Основные документы, перечисленные в части первой этой библиографии, включают 348 документов, насчитывающих приблизительно 12 000 страниц:

| | | Документы | Страницы |
|---|---|---|---|
| - от правительств: | | | |
| Национальные доклады | (1.1.1 - 1.1.77) | 77 | 3 586 |
| Монографии | (1.2.1 - 1.2.31) | 31 | 1 460 |
| Прочие документы | (1.3.1 - 1.3.30) | 30 | 787 |
| | Всего от правительств | 138 | 5 833 |
| - от системы ООН | | | |
| Органы ООН | (2.1 - 2.40) | 40 | 1 967 |
| Учреждения и МАГАТЭ | (3.1 - 3.86) | 86 | 1 273 |
| | Всего от системы ООН | 126 | 3 240 |
| - из других источников | | | |
| Межправительственные организации | (4.1 - 4.13) | 13 | 285 |
| Международные неправительственные организации | (5.1 - 5.47) | 47 | 818 |
| Национальные организации и т.д. | (6.1 - 6.16) | 16 | 1 235 |
| | Всего из других источников | 76 | 2 338 |
| - проекты документов для ориентировки | (7.1 - 7.8) | 8 | 596 |
| | ИТОГО | 348 | 12 007 |

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[1] Тематический раздел I: Населенные пункты
" " II: Природные ресурсы
" " III: Загрязнители
" " IУ: Информационные, социальные и культурные аспекты
" " У: Развитие и окружающая среда
" " УI: Международные организационные последствия.

Следует отметить, что ряд тем, перечисленных для рассмотрения в одном тематическом разделе в докладе Подготовительного комитета о его второй сессии (A/CONF.48/PC/9, пункт 20) фактически рассматривались в документах Конференции в других тематических разделах. Так, например, тема "III "c" "iii" - Земля" рассматривается в рекомендациях по тематическому разделу II. В таких случаях, хотя представленная основная документация может относиться к тематическому разделу, в котором соответствующие темы были первоначально поставлены, аннотации в этой библиографии относятся к тематическим разделам, в которых темы фактически рассматривались.

# CONFERENCE BIBLIOGRAPHY
# BIBLIOGRAPHIE DE LA CONFERENCE
# BIBLIOGRAFIA DE LA CONFERENCIA

## Part One
## Première partie
## Primera parte

### BASIC DOCUMENTS - contributed to the Conference secretariat in connexion with its preparations for the Conference

### DOCUMENTS DE BASE soumis au secrétariat de la Conférence dans le cadre des travaux préparatoires de la Conférence

### DOCUMENTOS BASICOS - presentados a la secretaría de la Conferencia en relación con los preparativos de ésta

### A.1 Basic documents received from Governments
### Documents de base communiqués par les gouvernements
### Documentos básicos recibidos de los gobiernos

### 1.1 National reports on environmental problems 1/
### Rapports nationaux sur les problèmes d'environnement 1/
### Informes nacionales sobre problemas del medio 1/

| | | | |
|---|---|---|---|
| 1.1.1 | Afghanistan<br>Afghanistan<br>Afganistán | Environmental problems of Afghanistan; Kabul University, Kabul, 25 June 1971 | E<br>11 pp. |
| 1.1.2 | Algeria<br>Algérie<br>Argelia | Rapport national | F<br>31 pp. |

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1/ A number of Governments have provided the secretariat with draft or provisional national reports. These reports are included in this list, on the understanding that the definitive versions will be substituted for them as soon as they are received.

Un certain nombre de gouvernements ont fourni au secrétariat des projets ou des versions provisoires de leurs rapports nationaux. Ces rapports sont mentionnés dans la présente liste, étant entendu que les versions définitives prendront leur place dès qu'elles auront été reçues.

Algunos gobiernos han enviado a la secretaría proyectos o textos provisionales de sus informes nacionales, los que figuran en esta lista en la inteligencia de que se reemplazarán por las versiones definitivas en cuanto se reciban.

| | | | |
|---|---|---|---|
| 1.1.3 | Argentina<br>Argentine<br>Argentina | Informe nacional - República Argentina; 1971 | S<br>30 pp. |
| 1.1.4 | Australia<br>Australie<br>Australia | Australian national report on problems of the human environment; (incl. contribution by National Capital Development Commission) | E<br>33 pp.<br>6 maps<br>6 cartes<br>6 mapas |
| 1.1.5 | Austria<br>Autriche<br>Austria | National report | E<br>66 pp. |
| 1.1.6 | Belgium<br>Belgique<br>Bélgica | Monographie de pays sur des problèmes relatifs à l'environnement; Commission interministérielle de la politique scientifique, Services du Premier Ministre; 30 juin 1971 | F<br>34 pp. |
| 1.1.7 | Bolivia<br>Bolivie<br>Bolivia | Informe nacional de Bolivia sobre el medio humano; Ministerio de Relaciones Exteriores y Culto, Comisión Interministerial Permanente; La Paz, marzo de 1971 | S<br>27 pp. |
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| | | - Information systems for international environmental decisions (3 pp.) | | IV |
| | | - Limiting the release of pollutants into the environment (9 pp.) | | III |
| | | - Marine pollution (13 pp.) | | III |

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|---|---|---|---|---|
| 1.3.29 | United States of America (Contd.)<br>Etats-Unis d'Amérique<br>Estados Unidos de América | - Monitoring the global environment (14 pp.) | | III |
| | | - Research, development and analysis (15 pp.) | | Gen. |
| | | - World Heritage Trust (4 pp.) | | IV |
| 1.3.30 | Zambia<br>Zambie<br>Zambia | Technical memorandum on ecological upheavals threatening Southern Africa; 23 June 1971 | E<br>3 pp.<br>+ plates and map<br>+ planches et carte<br>+ láminas y mapa | III |

B. Basic documents prepared within the UN system[1]
Documents de base préparés par les organismes des Nations Unies[1]
Documentos básicos preparados por organizaciones del sistema de las Naciones Unidas [1]

2. United Nations bodies[2]
Organes des Nations Unies[2]
Organos de las Naciones Unidas[2]

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[1] A number of basic documents prepared in connexion with subject area V, "Development and Environment", are listed in Section II of this bibliography among the working papers and background papers submitted to the Panel of Experts on Development and Environment.

Plusieurs documents de base élaborés à propos du thème V ("Développement et environnement") sont énumérés dans la section II de la présente bibliographie parmi les documents de travail et les documents généraux soumis au Groupe d'experts sur le développement et l'environnement.

Algunos documentos básicos relativos a la materia de estudio V, "El desarrollo y el "medio", se enumeran en la sección II de esta bibliografía, junto con los documentos de trabajo e informativos presentados al Grupo de Expertos sobre el desarrollo y el medio.

[2] As a result of consultations between the interested United Nations departments and agencies and the Conference secretariat, a number of departments and agencies accepted responsibility for preparing basic papers on specific topics listed in paragraph 20 of the report on the second session of the Preparatory Committee (A/CONF.48/PC.9). Departments and agencies other than the one responsible for a particular paper were invited to make contributions to that paper on aspects within their competence. This section of the bibliography lists both basic papers and contributions.

A la suite des consultations qui ont eu lieu entre les départements et institutions intéressés des Nations Unies et le secrétariat de la Conférence, un certain nombre de départements et d'institutions ont accepté de se charger de rédiger des documents de base sur des sujets précis énumérés au paragraphe 20 du rapport sur la deuxième session du Comité préparatoire (A/CONF.48/PC.9). Les départements et institutions autres que celui ou celle qui avait accepté de rédiger un document particulier ont été invités à apporter une contribution à ce document sur les questions qui relèvent de leur compétence. Cette section de la bibliographie énumère les documents de base et les "contributions".

A raiz de consultas entre los departamentos y organismos interesados de las Naciones Unidas y la secretaría de la Conferencia, varios departamentos y organismos accedieron a preparar documentos básicos sobre las temas concretos enumerados en el párrafo 20 del informe sobre el segundo período de sesiones de la Comisión Preparatoria (A/CONF.48/PC.9). Se invitó asimismo a los departamentos y organismos que no habian preparado ningún documento especial a contribuir con trabajos sobre materias de su competencia. En esta sección de la bibliografía se enumeran tanto los documentos básicos como las "contribuciones".

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|---|---|---|---|---|
| 2.1 | Administrative Committee on Coordination (ACC)<br>Comité administratif de coordination (CAC)<br>Comité Administrativo de Coordinación (CAC) | Annex II to the consolidated document on the UN system and the human environment - activities of the UN organizations in relation to the agenda for the Stockholm conference [1] | E<br>55 pp. | VI |
| 2.2 | Economic and Social Affairs (ESA)/Centre for Housing, Building and Planning (CHBP)[2]<br>Département des affaires économiques et sociales (ESA)/Centre de l'habitation, de la construction et de la planification[2]<br>Departamento de Asuntos Económicos y Sociales/Centro de Vivienda, Construcción y Planificación [2] | Comprehensive development planning (including annexes); May 1971 | E<br>77 pp. | I |
| 2.3 | " | Management of settlements development; May 1971 | E<br>66 pp. | I |
| 2.4 | " | Rural development; May 1971 | E<br>64 pp. | I |
| 2.5 | " | Housing and related facilities; May 1971 | E<br>60 pp. | I |
| 2.6 | " | Transitional and marginal areas; May 1971 | E<br>56 pp. | I |
| 2.7 | " | Problems of central city areas (including summary); May 1971 | E<br>35 pp. | I |
| 2.8 | " | Recreation and leisure; May 1971 | E<br>36 pp. | I |

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[1] The consolidated document and Annex I are published as document A/CONF.48/12.

Le document d'ensemble et l'Annexe I ont été publiés sous la cote A/CONF.48/12.

El documento consolidado y el anexo I se publican como documento A/CONF.48/12.

[2] See also joint paper with ESA/Population Division item 2.14.

Voir également, sous le chiffre 2.14, le document publié en collaboration avec la Division de la population du Département des affaires économiques et sociales.

Véase también el documento preparado conjuntamente por el Departamento de Asuntos Económicos y Sociales y la División de Población (numero 2.14).

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| 2.9 | Economic and Social Affairs (ESA)/Centre for Housing, Building and Planning (CHBP)(contd.)<br>Département des affaires économiques et sociales (ESA)/Centre de l'ahbitation, de la construction et de la planification (suite)<br>Departamento de Asuntos Económicos y Sociales/Centro de Vivienda, Construcción y Planificación (cont.) | Interaction between building and the environment of human settlements; H. Ramic; May 1971 | E<br>30 pp. | I |
| 2.10 | " | Summaries of papers prepared by ESA/CHBP on subject area I; May 1971 | E<br>59 pp. | I |
| 2.11 | " | Proposed actions (from papers prepared by ESA/CHBP on subject area I) | E<br>19 pp. | I |
| 2.12 | ESA/Division of Public Finance and Financial Institutions<br>ESA/Division des finances publiques et des institutions financières<br>Departamento de Asuntos Económicos y Sociales/División de Hacienda Pública e Instituciones Financieras | Pollution taxes (preliminary report); with R.E. Slitor, US Treasury; 26 May 1971 | E<br>133 pp. | III |
| 2.13 | " | Note sur une politique fiscale et financière de lutte contre la pollution à l'échelle nationale et internationale; Max Cluseau, Professeur à l'Université des Sciences sociales de Toulouse | F<br>91 pp. | III |

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|---|---|---|---|---|
| 2.14 | ESA/Population Division (in cooperation with CHBP)<br>ESA/Division de la population (en collaboration avec le Centre de l'habitation, de la construction et de la planification)<br>Departamento de Asuntos Económicos y Sociales/División de Población en común con el Centro de Vivienda, Construcción y Planificación) | Population growth and distribution; May 1971 | E<br>54 pp. | I |
| 2.15 | ESA/Public Administration Division<br>ESA/Division de l'administration publique<br>Departamento de Asuntos Económicos y Sociales/División de Administración Pública | Organizational and administrative aspects of environmental problems at various levels (including abstract); L.K. Caldwell; May 1971 | E<br>71 pp. | |
| 2.16 | ESA/Resources and Transport Division (RTD)<br>ESA/Division des ressources et des transports<br>Departamento de Asuntos Económicos y Sociales/División de Recursos y Transportes | Development and environmental aspects of transportation in the context of human settlements; with J.S. Revis, Institute of Public Administration, Washington, D.C., USA; June 1971 | E<br>74 pp. | I |
| 2.17 | " | Prospects for the development of less-polluting sources of energy; W.T. Reid, Battelle Institute, USA; June 1971 | E<br>67 pp. | II/III |
| 2.18 | " | Energy and environmental policy for developing countries; J.K. Delson; June 1971 | E<br>50 pp. | II |
| 2.19 | " | Evaluation of new technologies for the detection, monitoring and analysis of atmospheric pollutants released by energy enterprises; G.L. Rao, Columbia University, New York, USA; June 1971 | E<br>48 pp. | II/III |
| 2.20 | " | Environmental aspects of mineral resources development - mining operations; T. Falkies, Pennsylvania State University, USA; June 1971 | E<br>28 pp. | II/III |

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|---|---|---|---|---|
| 2.21 | ESA/Resources and Transport Division (RTD) (contd.)<br>ESA/Division des ressources et des transports (suite)<br>Departamento de Asuntos Económicos y Sociales/División de Recursos y Transportes (cont.) | Environmental aspects of mineral resources development - mineral processing; F.A. Aplan, Pennsylvania State University, USA; June 1971 | E<br>28 pp. | II/III |
| 2.22 | " | Environmental aspects of transport for natural resources development; with R.E. Rechel and R. Witherspoon, Institute of Public Administration, Washington, D.C., USA; June 1971 | E<br>49 pp. | II |
| 2.23 | " | The impact of the motor vehicles on air, noise and safety - problems and policies; with S. Myers, Institute of Public Administration, Washington, D.C., USA; June 1971 | E<br>48 pp. | III |
| 2.24 | " | Gas, oil and coal purification from the standpoint of environmental quality control; A.M. Squires, City College, New York, USA; June 1971 | E<br>40 pp. | III |
| 2.25 | " | The development of smokeless fuels from coal from the standpoint of minimizing environmental pollution; F.C. Schora and C.W. Matthews, Institute of Gaz and Technology, Chicago, USA; June 1971 | E<br>34 pp. | III |
| 2.26 | " | Recovery and utilisation of waste heat from the standpoint of minimizing pollution; K. Goldsmith; June 1971 | E<br>31 pp. | III |
| 2.27 | " | Some aspects of pollution reduction through improved energy conversion and utilisation; R.J. Schoeppel, Oklahoma State University, USA; June 1971 | E<br>49 pp. | III |

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| 2.28 | ESA/Resources and Transport Division (RTD) (contd.)<br>ESA/Division des ressources et des transports (suite)<br>Departamento de Asuntos Económicos y Sociales/Division de Recursos y Transportes (cont.) | Technological and economic prospects for the development of low-cost smokeless fuels; A. Lahiri, Central Fuel Research Institute, India; June 1971 | E<br>65 pp. | III |
| 2.29 | " | Environmental aspects of water resources managements; W.C. Ackermann, President, Committee on Water Research of ICSU; June 1971 | E<br>44 pp. | II |
| 2.30 | " | Management of water resources common to more than one national jurisdiction; I.K. Fox et al., University of Wisconsin, USA; June 1971 | E<br>43 pp. | II |
| 2.31 | " | Co-operative measures for maintaining and improving the quality of the hydrosphere; E.F. Gloyna et al.; June 1971 | E<br>68 pp. | II |
| 2.32 | " | Means of preventing or decreasing flood losses; W.R.D. Sewell, University of Victoria, Canada; June 1971 | E<br>30 pp. | I |
| 2.33 | " | Means of preventing or minimizing damage from earthquakes; G.V. Berg, University of Michigan, USA; June 1971 | E<br>22 pp. | I |
| 2.34 | ESA/Social Development Division<br>ESA/Division du développement social<br>Departamento de Asuntos Económicos y Sociales/División de Desarrollo Social | Ethics and the environment; 19 May 1971 | E<br>7 pp. | IV |
| 2.35 | Office for Inter-Agency Affairs<br>Bureau des affaires inter-organisations<br>Oficina de Asuntos entre Organismos | Assistance in cases of natural disaster (E/4994); 13 May 1971 | E<br>72 pp.<br>(also in F,R,S)<br>(également en F,R,S) | I |

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| 2.36 | United Nations Industrial Development Organization (UNIDO)<br>Organisation des Nations Unies pour le développement industriel (ONUDI)<br>Organización de las Naciones Unidas para el Desarrollo Industrial (ONUDI) | Industry in relation to the planning and management of human settlements for environmental quality | E<br>25 pp. | I |
| 2.37 | " | Industry in development and the environment (draft - incomplete) | E<br>30 pp. | V |
| 2.38 | " | Pollutants and nuisances from manufacturing industries (draft - incomplete) | E<br>51 pp. | III |
| 2.39 | United Nations Institute for Training and Research (UNITAR)<br>Institut des Nations Unies pour la formation et la recherche (UNITAR)<br>Instituto de las Naciones Unidas para formacion profesional et investigaciones (UNITAR) | International environmental regulations : means of achieving environmental quality (provisional draft) | E<br>40 pp. | III |
| 2.40 | United Nations Scientific Committee on Effects of Atomic Radiation (UNSCEAR)<br>Comité scientifique des Nations Unies pour l'étude des effets des rayonnements ionisants<br>Comité Científico de las Naciones Unidas para el Estudio de los Efectos de las Radiaciones Atomicas | Assessment and control of environmental contamination : experience with artificial radio-activity (revised); G.C. Butler (Canada), I.L. Karol (USSR), B. Lindell (Sweden), D.J. Stevens (Australia) and V. Zeleny (Czechoslovakia); 28 June 1971 | E<br>18 pp. | III |

3. Specialized agencies and IAEA
Institutions spécialisées et AIEA
Organismos especializados y OIEA

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|---|---|---|---|---|
| 3.1 | Food and Agriculture Organization of the United Nations (FAO) 1/<br>Organisation des Nations Unies pour l'alimentation et l'agriculture (FAO) 1/<br>Organización de las Naciones Unidas para la Agricultura y la Alimentación (FAO) 1/ | The environmental aspects of natural resource management - agriculture and soils | E<br>42 pp. | II |
| 3.2 | " | Forestry (Draft); 30 June 1971 | E<br>39 pp. | II |
| 3.3 | " | Fish and fisheries in the context of environmental concern (Draft); 31 May 1971 | E<br>15 pp. | II |
| 3.4 | " | Land degradation (Draft); June 1971 | E<br>120 pp. | II |
| 3.5 | " | The significance, utilization and conservation of crop genetic resources (Draft); with Sir O. Frankel | E<br>31 pp | II |
| 3.6 | " | The environmental aspects of water resources development and management, with suggestions for action; 17 August 1971 | E<br>69 pp | II |
| 3.7 | FAO (jointly with UNESCO and IUCN)<br>FAO (en collaboration avec l'UNESCO et l'UICN)<br>FAO (en común con UNESCO y IVCN) | Wildlife, national parks, and recreational resources (Draft); 25 June 1971 | E<br>69 pp. | II |

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1/ FAO is currently publishing a series of summaries of its basic papers, which will be included in the Conference library.

La FAO a entrepris de publier une série de résumés de ses documents de base; ces résumés feront partie également de la bibliothèque de la Conférence.

La FAO publica actualmente una serie de resúmenes de sus documentos básicos, que formarán parte de la biblioteca de la Conferencia.

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| 3.8 | FAO and WHO<br>FAO et OMS<br>FAO y OMS | Identification, effects and control of contamination through man's food chain (Draft) | E<br>43 pp. | III |
| | | Papers prepared by members of the Cooperative Programme of Agro-allied Industries with FAO and other UN organizations : | E | |
| 3.9 | FAO/Industry Cooperative Programme<br>Programme de coopération FAO/industrie<br>Programa de Cooperación FAO/Industria | - Pesticides and the environment | 11 pp. | II/III |
| 3.10 | " | - Pesticides in perspective | 4 pp. | II/III |
| 3.11 | " | - Fungicides | 7 pp. | II/III |
| 3.12 | " | - Herbicides | 6 pp. | II/III |
| 3.13 | " | - Organochlorine insecticides | 11 pp. | II/III |
| 3.14 | " | - Organophosphorus insecticides | 6 pp. | II/III |
| 3.15 | " | - Crop protection and the balance of nature | 6 pp. | II/III |
| 3.16 | " | - Integrated control of pests and diseases | 11 pp. | II/III |
| 3.17 | " | - The development of a new pesticide | 12 pp. | II/III |
| 3.18 | " | - The effect of pesticides on the economy of Latin American countries | 5 pp. | II/V |
| 3.19 | " | - The effect of pesticides on the economy of some African countries | 11 pp. | II/V |
| 3.20 | " | - The effect of pesticides on the economy of Asian countries | 6 pp. | II/V |

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| 3.21 | Inter-Governmental Maritime Consultative Organization (IMCO)<br>Organisation intergouvernementale consultative de la navigation maritime (OMCI)<br>Organización Consultiva Marítima Intergubernamental (OCMI) | *Identification and control of pollutants emanating from ships, vessels and other equipment operating in the marine environment* (Revised 9 February 1972) | E<br>36 pp. | III |
| 3.22 | International Atomic Energy Agency (IAEA)<br>Agence internationale de l'énergie atomique (AIEA)<br>Organismo Internacional de Energía Atómica (OIEA) | *The environmental aspects of natural resources management - special problems related to nuclear energy and fossil fuels* | E<br>28 pp. | II |
| 3.23 | " | *Notes on the IAEA safety standards* | E<br>3 pp. | III |
| 3.24 | IAEA and WHO<br>AIEA et OMS<br>OIEA y OMS | *Identification and control of pollutants and nuisances of broad international significance, with special reference to nuclear activities* | E<br>20 pp. | III |
| 3.25 | International Civil Aviation Organization (ICAO)<br>Organisation de l'aviation civile internationale (OACI)<br>Organización de Aviación Civil Internacional (OACI) | *The role of civil aviation in the relationship between technological advancement and the human environment* | E/F/S<br>11 pp. | I/III |
| 3.26 | International Labour Organization (ILO)<br>Organisation internationale du travail (OIT)<br>Organización Internacional del Trabajo (OIT) | *Participation of employers' and workers' organizations and other social institutions in activities for the protection of the human environment* | E<br>9 pp. | |
| 3.27 | " | *The working environment (environmental specifications for working places)* | E<br>15 pp. | I |
| 3.28 | " | *Educational, informational social and cultural aspects of environmental issues - workers' and management education* | E<br>5 pp. | IV |

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|---|---|---|---|---|
| 3.29 | United Nations Educational, Scientific and Cultural Organization (UNESCO) 1/<br>Organisation des Nations Unies pour l'éducation, la science et la culture (UNESCO) 1/<br>Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura (UNESCO) 1/ | The planning and management of human settlements for environmental quality - social, cultural and aesthetic factors | E<br>8 pp. | I |
| 3.30 | " | Effets des interventions de l'homme dans les systèmes écologiques naturels - problèmes écologiques spéciaux aux régions arides, tropicales, arctiques, de marais, insulaires, etc. | F<br>22 pp. | II |
| 3.31 | " | Effects of pollutants and nuisances of international significance : identification and evaluation of related effects on other living organisms and soils | E<br>14 pp. | III |
| 3.32 | " | Effects of pollutants and nuisances of international significance : transport of pollutants in the biosphere | E<br>4 pp. | III |
| 3.33 | " | Identification and study of principal elements in planetary life support system | E<br>17 pp. | II/III |
| 3.34 | " | Educational aspects of environmental issues | E<br>10 pp. | IV |
| 3.35 | " | Social aspects of environment | E<br>9 pp. | IV |
| 3.36 | " | Cultural aspects of the environment | E<br>13 pp. | IV |

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1/ See also joint paper with FAO and IUCN, item 3.5.

Voir également le document préparé en collaboration avec la FAO et l'UICN (3.5).

Vease también documento preparado en común con FAO y IUCN, número 3.5.

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| 3.37 | United Nations Educational, Scientific and Cultural Organization (UNESCO) (contd.)<br>Organisation des Nations Unies pour l'éducation, la science et la culture (UNESCO) (suite)<br>Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura (UNESCO) (cont.) | Moyens d'introduire la notion d'environnement dans la planification et la gestion d'ensemble de la mise en valeur des ressources naturelles; Note à l'usage du secrétariat de la Conférence des Nations Unies sur l'environnement humain | F<br>5 pp. | II |
| 3.38 | " | The environmental aspects of natural resources management : agriculture and soil; Note for the attention of FAO | E<br>3 pp. | II |
| 3.39 | " | Water | E<br>19 pp. | II |
| 3.40 | " | Cooperative measures for maintaining and improving the quality of the hydrosphere (inland waters) | E<br>7 pp. | II |
| 3.41 | " | Genetic pools | E<br>3 pp. | II |
| 3.42 | " | La dégradation des terres; Note à l'attention de la FAO | F<br>7 pp. | II |
| 3.43 | " | Management of resources of regional importance | E<br>5 pp. | II |
| 3.44 | " | Informational aspects of environmental issues | E<br>2 pp. | IV |
| 3.45 | UNESCO/International Social Science Council<br>UNESCO/Conseil international des sciences sociales<br>UNESCO/Consejo Internacional de Ciencias Sociales | Environnement : le point de vue des sciences sociales; le 24 mai 1971 | F<br>26 pp. | IV |

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| 3.46 | World Health Organization (WHO) 1/<br>Organisation mondiale de la Santé (OMS) 1/<br>Organización Mundial de la Salud (OMS) 1/ | Water supply, sewage and waste disposal | E<br>41 pp. | I |
| 3.47 | " | Human health and welfare factors | E<br>47 pp. | I |
| 3.48 | " | Contamination through water contact : criteria, guides and standards for permissible levels of human exposure | E<br>69 pp. | III |
| 3.49 | " | Identification and evaluation of the principal acute and long-term effects of environmental agents on man's health, including genetic effects | E<br>52 pp. | III |
| 3.50 | " | Industry in relation to the planning and management of human settlements for environmental quality - climatic, topographic and geological characteristics of particular interest to public health to be taken into account in siting industries | E<br>3 pp. | I |
| 3.51 | " | Housing and related facilities - human requirements | E<br>3 pp. | I |
| 3.52 | " | Transitional and marginal areas | E<br>2 pp. | I |
| 3.53 | " | Recreation and leisure - environmental aspects of tourism | E<br>2 pp. | I |

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1/ See also joint FAO/WHO paper (item 3.6) and joint IAEA/WHO paper (item 3.22).

Voir également le document conjoint FAO/OMS (3.6) et le document conjoint AIEA/OMS (3.22).

Vease también trabajos preparados en común con la FAO (número 3.6) y con el OIEA (número 3.22).

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| 3.54 | World Health Organization (WHO) (contd.)<br>Organisation mondiale de la Santé (OMS) (suite)<br>Organización Mundial de la Salud (OMS) (cont.) | Transport and communications - air pollution from motor vehicles and other transport systems | E<br>3 pp. | I/III |
| 3.55 | " | Water supply, sewage and waste disposal (recycling) | E<br>1 p. | I |
| 3.56 | " | Hazards from natural disasters - health considerations in natural disasters | E<br>2 pp. | I |
| 3.57 | " | Wildlife and recreational resources - natural resources in relation to recreation and tourism | E<br>2 pp. | II |
| 3.58 | " | Water | E<br>3 pp. | II |
| 3.59 | " | Energy - air pollution from energy production | E<br>3 pp. | II/III |
| 3.60 | " | Minerals - air pollution aspects of mineral resources development | E<br>2 pp. | II/III |
| 3.61 | " | Transport - environmental pollution from pipelines | E<br>1 p. | II/III |
| 3.62 | " | Management of natural resources of special regional importance - water quality in international river basins | E<br>2 pp. | II |
| 3.63 | " | Land - measures required to identify, evaluate and control changes | E<br>7 pp. | II |
| 3.64 | " | Mining - saline water pollution in Poland | E<br>2 pp. | III |

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| 3.65 | World Health Organization (WHO) (contd.)<br>Organisation mondiale de la Santé (OMS) (suite)<br>Organización Mundial de la Salud (OMS) (cont.) | Energy production - air pollutants of public health importance derived from energy production | E | 4 pp. | III |
| 3.66 | " | Water transport : ocean - disposal of sewage from ships in the course of normal operations | E | 2 pp. | III |
| 3.67 | " | Land transport - effects of pollutants on people | E | 3 pp. | III |
| 3.68 | " | Industrial pollution - environmental health aspects of chemical and petroleum industry | E | 2 pp. | III |
| 3.69 | " | Transport of pollutants in the biosphere; contamination through man's food chain, contamination through water supply and air supply, criteria, standards and guides for permissible levels of human exposure | E | 1 p. | III |
| 3.70 | " | Hydrosphere - health aspects of coastal pollution | E | 3 pp. | III |
| 3.71 | " | Education - the education of engineers for environmental health | E | 3 pp. | IV |
| 3.72 | " | Environmental considerations in the choice of location of new industries - public health considerations in siting of polluting industries | E | 2 pp. | V |

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| 3.73 | WHO/International Agency for Research on Cancer<br>OMS/Centre international de recherche sur le cancer<br>OMS/Centro Internacional de Investigaciones sobre el Cancer | Working paper | E<br>7 pp. | I/III |
| 3.74 | World Meteorological Organization (WMO) 1/<br>Organisation météorologique mondiale (OMM) 1/<br>Organización Meteorológica Mundial (OMM) 1/ | Human health and welfare factors : urban climates | E<br>10 pp. | I |
| 3.75 | " | The quality of air as a resource to support life | E<br>15 pp. | II |
| 3.76 | " | Transport of pollutants in the biosphere - contamination through air supply | E<br>16 pp. | III |
| 3.77 | " | Climatic effects of air pollution (Identification and evaluation of air pollution effects on climate) | E<br>27 pp. | III |
| 3.78 | " | Effects of air pollution on materials (Identification and evaluation of effects on goods, materials, buildings, construction, etc.: problems of corrosion) | E<br>8 pp. | III |

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1/ A number of the basic papers submitted by WMO have been published by WMO in a slightly different form in "Special Environmental Report No. 2, Selected papers on Meteorology as related to the Human Environment" (WMO, No. 312, Geneva, 1971). This publication will also be available in the Conference library.

Un certain nombre de documents de base soumis par l'OMM ont été publiés par cette organisation sous une forme légèrement différente, dans "Rapport spécial No 2, choix d'exposés sur la météorologie et ses relations avec le milieu humain" (OMM, No 312, Genève, 1971). Cette publication pourra également être consultée à la bibliothèque de la Conférence.

Varios de los documentos básicos presentados por la OMM han sido publicados por la OMM, en forma ligeramente diferente, en Informe especial número 2 sobre el medio ambiente humano - Selección de documentos sobre la meteorología y sus relaciones con el medio ambiente humano (OMM, No 312, Ginebra 1971). Esta publicación también podrá consultarse en la biblioteca de la Conferencia.

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|---|---|---|---|---|
| 3.79 | World Meteorological Organization (WMO) (contd.)<br>Organisation météorologique mondiale (OMM) (suite)<br>Organización Meteorológica Mundial (OMM) (cont.) | Control of atmospheric pollution (Atmosphere - measures required to control effects of changes in composition and condition of atmosphere) | E<br>19 pp. | III |
| 3.80 | " | Implications of intentional weather and climate modification on the human environment (Atmosphere - measures required to controle effects on changes in composition and conditions of atmosphere) · M. Neiburger | E<br>22 pp. | III |
| 3.81 | " | Housing and related facilities - building climatology | E<br>13 pp. | I |
| 3.82 | " | Considerations of climatic elements in planning and management of natural resources (environmental considerations in natural resource development) | E<br>6 pp. | II |
| 3.83 | " | Water - maintenance of water quality | E<br>6 pp. | II |
| 3.84 | " | Regional aspects of air pollution (Management of natural resources of special regional importance) | E<br>13 pp. | II |
| 3.85 | " | Identification of principal types of air pollutants, their dispersion and transformation | E<br>10 pp. | III |
| 3.86 | " | Meteorological aspects of transport and monitoring of marine pollution (Hydrosphere) | E<br>3 pp. | III |

## C. Basic documents received from other sources
## Documents de base communiqués par d'autres sources
## Documentos básicos procedentes de otras fuentes

### 4. Intergovernmental organizations (non-United Nations)
### Organisations intergouvernementales (non reliées aux Nations Unies)
### Organizaciones intergubernamentales (no pertenecientes al sistema de las Naciones Unidas

| | | | | |
|---|---|---|---|---|
| 4.1 | African Development Bank<br>Banque africaine de développement<br>Banco Africano de Desarrollo | Environmental Consideration in project appraisal : the experience of the African Development Bank in financing projects in Africa | E<br>8 pp. | V |
| 4.2 | Commission of the European Communities<br>Commission des Communautés européennes<br>Comisión de las Comunidades Europeas | La place de la Communauté européenne dans l'effort mondial pour la protection et l'amélioration de l'environnement | F<br>51 pp. | Gen. |
| 4.3 | Council for Mutual Economic Assistance<br>Conseil d'aide économique mutuelle<br>Consejo de Asistencia Económica Mutua | Информация о деятельности Совета экономической Взаимопомощи в области окружающей среды<br>(Information on the activities of the Council for Mutual Economic Assistance in the field of the human environment) | R<br>10 pp. | Gen. |
| 4.4 | European Nuclear Energy Agency<br>Agence européenne de l'énergie nucléaire<br>Organismo europeo de la energía atómica | Nuclear energy and the environment; 24 May 1971 | E<br>11 pp. | II/III |
| 4.5 | Inter-American Development Bank<br>Banque interaméricaine de développement<br>Banco Interamericano de Desarrollo | Environmental problems of agricultural settlement and agrarian reform; H.T. Jorgensen; Washington D.C., June 1971 | E<br>35 pp. | I |
| 4.6 | " | Conservation and pollution of water resources; H. Olivero; Washington D.C., 8 June 1971 | E<br>7 pp. | II/III |

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|---|---|---|---|---|
| 4.7 | Inter-American Development Bank (contd.)<br>Banque interaméricaine de développement (suite)<br>Banco Interamericano de Desarrollo (cont.) | Environmental problems of urban development; E. Novaes et al.; Washington D.C., June 1971 | E<br>14 pp. | I |
| 4.8 | " | Accounting for environmental pollution in social cost-benefit analysis of industry; H. Schwartz; Washington D.C., June 1971 | E<br>7 pp. | III/V |
| 4.9 | Organization for Economic Cooperation and Development (OECD)<br>Organisation de coopération et de développement économiques (OCDE)<br>Organización de Cooperación y Desarrollo Económicos (OCDE) | Problèmes et instruments relatifs à l'allocation des coûts d'environnement | F<br>32 pp. | V |
| 4.10 | OECD Development Centre<br>Centre de développement de l'OCDE<br>Centro de Desarrollo de la OCDE | Cost-benefit analysis in developed and developing countries (with particular reference to environmental problems); D. Conn | E<br>15 pp. | V |
| 4.11 | " | Rural-urban migration and job location : some thoughts on future research; P. J. Richards | E<br>9 pp. | I |
| 4.12 | Organization of American States<br>Organisation des Etats américains<br>Organización de los Estados Americanos | Urbanization and the human environment in Latin America (preliminary version); Division of Urban Development, Dept. of Social Affairs; May 1971 | E<br>74 pp. | I |
| 4.13 | " | Development versus environment : an urban systems approach; C. Frankenhoff, University of Puerto Rico; May 1971 | E<br>12 pp. | I |

## 5. International non-governmental organizations
## Organisations internationales non gouvernementales
## Organizaciones internacionales non gubernamentales

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|---|---|---|---|---|
| 5.1 | Arctic Institute of North America | Paper addressed to the UN Conference on the Human Environment; Montreal, November 1971 | E<br>19 pp. | II/III |
| 5.2 | Boy Scouts World Bureau<br>Bureau mondial du scoutisme<br>Oficina Mundial de Exploradores | Scouting and conservation; Geneva, June 1971 | E<br>20 pp. | IV |
| 5.3 | Commission of the Churches on International Affairs (World Council of Churches)<br>Commission des églises pour les affaires internationales (Conseil mondial des églises)<br>Comisión de las Iglesias para los Asuntos Internacionales (Concilio Mundial de Iglesias) | Action on the environment and hopes for the future of man - the cruciality of political issues; Geneva, 24 May 1971 | E<br>23 pp. | Gen. |
| 5.4 | European Institute of Cancerology<br>Institut européen de cancérologie | Une charte européenne de prévention des maladies de l'environnement; motion votée par le Symposium cancérologique, Bruxelles, 2-3 décembre 1971 | F.<br>2 pp. (also E 2 pp.)<br>(également E, 2 pp.) | I/III |
| 5.5 | European Union against Aircraft Nuisance | Reduction of aircraft noise nuisance; G. Holmes, UK Federation Against Aircraft Nuisance; 31 May 1971 | E<br>3 pp. | I |
| 5.6 | Groupement international des associations nationales de fabricants de pesticides | Mémorandums techniques Nos 1 à 6 | F<br>15 pp. (also E 15 pp.)<br>(également E, 15 pp.) | II/III |
| 5.7 | International Air Transport Association (IATA)<br>Association du transport aérien international (IATA)<br>Asociación de Transporte Aéreo Internacional (IATA) | IATA statement of policy on noise and atmospheric pollution arising from the operation of aircraft; resolution of IATA Annual General Meeting, Honolulu, November 1971 | E<br>3 pp. | I/III |

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| 5.8 | International Association for Pollution Control | The focus of worldwide environmental education of the future; J. Pavoni, et al | E<br>23 pp. | IV |
| 5.9 | " " | Urban noise; D.J. Hagerty et al | E<br>12 pp. | I |
| 5.10 | International Association for the protection of Industrial Property<br>Association internationale pour la protection de la propriété industrielle<br>Asociación Internacional para la Protección de la Propiedad Industrial | The menace to our environment and the protection of intellectual property, R.E. Blum | E<br>21 pp. | II |
| 5.11 | International Astronautical Federation<br>Fédération internationale d'astronautique<br>Federación Astronáutica Internacional | 10 papers selected from the 22nd International Astronautical Congress (Brussels, 20-25 September 1971) for contribution to the Conférence on the Human Environment; selected by L. Jaffe and K. Kondratyev; one volume including following papers: | | III |
| | | - Numerical experiments on laser sounding of the atmosphere from outer space; V.E. Zuev et al (revised) | E<br>20 pp. | |
| | | - The dust-sand flows and storms in the atmosphere from space imagery; B.V. Vinogradov et al (revised) | E<br>13 pp. | |
| | | - Meteorological aspects of atmospheric pollution and possibilities of observations from space, K. Kondratyev et al (revised) | E<br>33 pp. | |
| | | - Man-made environment as viewed from space: water and air pollution; B.V. Vinogradov (revised) | E<br>16 pp. | |

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|---|---|---|---|---|
| | International Astronautical Federation (contd.)<br>Fédération internationale d'astronautique (suite)<br>Federación Astronáutica internacional (cont.) | - An application of a space technique for pollution detection; J.J. Hall | E<br>23 pp. | |
| | | - Remote sensing of chlorophyll and temperature in marine and fresh waters; J.C. Arveson, J.P. Millard | E<br>31 pp. | |
| | | - Environmental quality indices from remote sensing data; W.O. Davis | E<br>14 pp. | |
| | | - Determination and registration of geothermic processes in the range of volcanic activity by satellite air pictures; H. Kaminski | E<br>40 pp. | |
| | | - Global monitoring and remote sensing from satellites; B. Lundholm | E<br>12 pp. | |
| | | - Global survey of atmospheric trace and pollutant molecules; R.A. Toth, C.B. Farmer | E<br>14 pp. | |
| 5.12 | International Building Council<br>Conseil international du bâtiment pour la recherche, l'étude et la documentation | Conception et organisation du développement des établissements | F<br>15 pp.<br>(also E 14 pp.)<br>(également E, 14 pp.) | I |
| 5.13 | International Commission on Radiological Protection (ICRP)<br>Commission internationale de protection contre les radiations (ICRP)<br>Comisión Internacional de Protección contra las Radiaciones | The role and experience of ICRP in radiation protection; C.G. Stewart and F.D. Sowby; 17 May 1971 | E<br>10 pp. | III |
| 5.14 | International Confederation of Free Trade Unions (International Housing Committee)<br>Confédération internationale des syndicats libres (Comité international de l'habitation)<br>Confederación Internacional de Organizaciones Sindicales Libres (Comité internacional de la vivienda) | The challenge of the environment; | E<br>39 pp.<br>(also F and S)<br>(également F et S) | Gen. |

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| 5.15 | International Conference of Women Engineers and Scientists | Contribution of women engineers and scientists to explore the possibilities of eliminating the impairing of the human environment; (including resolution of Third International Conference of Women Engineers and Scientists, Turin, 5-12 September 1971) | E<br>10 pp. | Gen. |
| 5.16 | International Co-operative Alliance<br>Alliance coopérative internationale<br>Alianza Cooperativa Internacional | Co-operatives and the environment | E<br>6 pp. | IV |
| 5.17 | International Council of Monuments and Sites<br>Conseil international des monuments et des sites<br>Consejo Internacional de Monumentos y Emplazamientos | Document de base; R.M. Lemaire, Secrétaire général; Louvain, le 27 mai 1971 | F<br>8 pp. | IV |
| 5.18 | International Council of Scientific Unions (ICSU)<br>- International Biological Programme<br>Conseil international des unions scientifiques<br>- Programme biologique international<br>Consejo Internacional de Uniones Cientificas (CIUC)<br>- Programa Internacional de Biologia | Basic paper; E.B. Worthington, Scientific Director; (including annex, "Plant genetic pools", by O.H. Frankel); 28 May 1971 | E<br>12 pp. | II |
| 5.19 | ICSU/Scientific Committee on Problems of the Environment (SCOPE)<br>CIUS/Comité scientifique des problèmes de l'environnement (SCOPE)<br>CIUC/Comité Cientifico sobre los Problemas del Medio Humano (SCOPE) | Global environmental monitoring; Commission on Monitoring of SCOPE; Stockholm; 1971 | E<br>68 pp. | III |

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| 5.20 | ICSU/International Union of Nutritional Sciences<br>CIUS/Union internationale des sciences de la nutrition<br>CIUC/Union Internacional de Ciencias de la Nutricion | Proposed position paper for monitoring malnutrition; O.L. Kline, Director, Office of Malnutrition Science Services, Bethesda, Md., USA | E<br>4 pp. | I/III |
| 5.21 | International Federation of Landscape Architects<br>Fédération internationale des architectes paysagistes<br>Federación Internacional de Arquitectos Paisajistas | The problems of human environment | E<br>4 pp. | I/IV |
| 5.22 | International Federation for Housing and Planning<br>Fédération internationale pour l'habitation, l'urbanisme et l'aménagement des territoires<br>Federación Internacional de la Vivienda, del Urbanismo y de Planificación Fisica | Conclusions on environmental problems accepted by the General Council; 32nd Congress; Belgrade, 11 June 1971 | E<br>2 pp. | I |
| 5.23 | International Geographical Union/Commission on Man and Environment<br>Union géographique internationale<br>Union Geografica Internacional | International response to environmental hazards; G.F. White; May 1971 | E<br>5 pp. | Gen. |
| 5.24 | " " " | Environmental protection and water development; G.F. White; May 1971 | E<br>14 pp. | II |
| 5.25 | International Organization of Consumers Unions<br>Organisation internationale des unions de consommateurs<br>Organizacion Internacional de las Uniones de Consumidores | The consumer and the environment; The Hague; 13 May 1971 | E<br>4 pp. | IV |
| 5.26 | " " " | Report on noise; The Hague; 1971 | E<br>77 pp. | I |
| 5.27 | " " " | Position papers submitted to the UN Conference on the Human Environment : | | |
| | | - Air pollution caused by motor vehicles | E<br>6 pp. | III |

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| 5.27 | International Organization of Consumers Unions (contd.)<br>Organisation internationale des unions de consommateurs (suite)<br>Organización Internacional de las Uniones de Consumidores (cont.) | - *Solid waste* | E<br>2 pp. | I |
| | | - *Marine pollution* | E<br>2 pp. | III |
| | | - *Education and information* | E<br>3 pp. | IV |
| 5.28 | International Planned Parenthood Federation<br>Fédération internationale pour le planning familial<br>Federación Internacional de Planificación de la Familia | *Population and environment*; London, 25 May 1971 | E<br>3 pp. | I |
| 5.29 | International Road Federation<br>Fédération routière internationale<br>Federación Internacional de Carreteras | Miscellaneous papers, including : | | I |
| | | - *Aspects of the design of urban highways*; F. Anm | E<br>5 pp. | |
| | | - *L'environnement du conducteur*; R. Coquand | F<br>3 pp. | |
| | | - *The automobile and clean air in the United States*; T.C. Mann | E<br>4 pp. | |
| | | - *Mobility and environment in Newcastle-upon-Tyne*; D.T. Bradshaw and K.A. Galley | E<br>7 pp. | |
| | | - *The southwest corridor - a joint development study*; L.F. De Marsh | E<br>3 pp. | |
| | | - *Urban road planning and the environment*; Lord Holford | E<br>7 pp. | |
| 5.30 | International Society for Rehabilitation of the Disabled<br>Société internationale pour la réadaptation des handicapés<br>Sociedad Internacional para la Rehabilitación de los Inválidos | *Human settlements and the needs of the aged and physically handicapped*; New York, 25 May 1971 | E<br>4 pp. | I |

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| 5.31 | International Society for Research on Civilisation Diseases and Vital Substances<br>Société internationale pour la recherche sur les maladies de civilisation et les substances vitales | Human ecological aspects and research of the environment; H.A. Schweigart, President | E<br>21 pp. | Gen. |
| 5.32 | International Society of Soil Science<br>Association internationale de la science du sol<br>Sociedad Internacional de Ciencias del Suelo | Environmental aspects of soil management and agricultural practices; F.A. van Baren | E<br>6 pp. | II |
| 5.33 | International Touring Alliance<br>Alliance internationale de tourisme<br>Alianza Internacional de Turismo | Prise de position de l'AIT et de ses clubs sur l'environnement en relation avec les loisirs et le tourisme; le 14 avril 1971 | F<br>5 pp.<br>(also E 4 pp.)<br>(également E, 4 pp.) | I |
| 5.34 | International Union of Building Societies and Savings Associations<br>Union internationale des sociétés de crédit différé<br>Unión Internacional de Asociaciones de ahorro y préstamos para vivienda | Housing and the Human environment; A.W. Moir; Sydney, Australia, 28 June 1971 | E<br>9 pp. | I |
| 5.35 | " " " | Resolution on the human environment adopted by the Twelth World Congress of the International Union of Building Societies and Savings Associations; Berlin, 17 September 1971 | E<br>1 pp. | I |
| 5.36 | International Union of Geodesy and Geophysics<br>Union géodésique et géophysique internationale<br>Unión Internacional de geodesia y geofísica | Resolution 20 of XVth General Assembly; Moscow, August 1971 | E/F<br>1 pp. | Gen. |
| 5.37 | International Union of Local Authorities<br>Union internationale des villes et pouvoirs locaux<br>Unión Internacional de Autoridades Locales | Local government and the human environment | E<br>7 pp. | Gen. |

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| 5.38 | International Union of Official Travel Organizations (IUOTO)<br>Union internationale des organismes officiels de tourisme (UIOOT)<br>Unión Internacional de organismos oficiales de Turismo (UIOOT) | Resolution XXII/11 - questions relating to the human environment; adopted by the XXIInd General Assembly of IUCTO; Ankara, October 1971 | E/F/S<br>1 pp. | I |
| 5.39 | International Youth Forum for European Conservation Year | Declaration; Lüneburger Heide, 25 July 1970 | E<br>4 pp. | IV |
| 5.40 | Union of International Associations<br>Union des associations internationales<br>Unión de Asociaciones Internacionales | Communication; Brussels, 21 May 1971 | E<br>4 pp. | Gen. |
| 5.41 | United Towns Organization<br>Fédération mondiale des villes jumelées<br>Federacion Mundial de Ciudades Hermanadas | In favour of a world environment policy; A. Chaudières | E<br>17 pp. | I |
| 5.42 | Women's International League for Peace and Freedom<br>Ligue internationale de femmes pour la paix et la liberté<br>Liga Internacional de Mujeres pro Paz y Libertad | Statement | E<br>6 pp. | III |
| 5.43 | World Association of World Federalists<br>Mouvement universel pour une fédération mondiale<br>Asociación Universal de Federalistas Mondiales | A United Nations environment agency; Ottawa, 26 May 1971 | E<br>5 pp. | VI |
| 5.44 | World Federation for Culture Collections | Conservation of genetic pools of micro-organisms; S.M. Martin; Ottawa, May 1971 | E<br>20 pp. | II |
| 5.45 | World Packaging Organization<br>Organisation mondiale de l'emballage | Solid waste - the third pollution | E<br>7 pp. | I |
| 5.46 | " " " | International project for package disposability factor rating; July 1971 | E<br>7 pp. | I |
| 5.47 | World Society for Ekistics<br>Société mondiale d'ékistique<br>Sociedad Mundial de Equistica | Report from the international conference on education in ekistics; Athens, 9-10 July 1971 | E<br>13 pp. | I/IV |

6. Other sources (national organizations, universities, individuals)[1]
Autres sources (organisations nationales, universités, particuliers)[1]
Otras fuentes (organizaciones nacionales, universidades, particulares)[1]

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|---|---|---|---|---|
| 6.1 | Albuquerque Department of Environmental Health (Albuquerque, New Mexico, USA, Etats-Unis d'Amérique, EE.UU.) | Air pollution problems in Albuquerque (case study) | E<br>14 pp. | III |
| 6.2 | H. Alfvén (Sweden, Suède, Suecia) | Energy and environment; January 1972 | E<br>11 pp. | II |
| 6.3 | Association des éclaireuses et éclaireurs de France (France, Francia) | L'homme et son milieu (Résumé des principales actions menées par les Eclaireuses et éclaireurs de France en 1970) | F<br>3 pp. | IV |
| 6.4 | J.R. Bellerby et al. (UK, Royaume-Uni, Reino Unido) | Human ecology and human values | E<br>25 pp. | IV |
| 6.5 | Brentree Environmental Center (Milford, Pa., USA, Etats-Unis d'Amérique, EE.UU.) | People and their environment - a case study of curriculum development for conservation education in the United States, 1964-1972; M. J. Brennan, Director | E<br>22 pp. | IV |
| 6.6 | Institute of Ecology (USA, Etats-Unis d'Amérique, EE.UU.) | Man in the living Environment | E<br>273 pp. | Gen. |

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[1] It should be noted that most national-level contributions to the preparations for the Conference were made by the organizations and individuals concerned to their national governments.

Il convient de noter que la plupart des études élaborées à l'échelon national en vue de préparer la Conférence ont été soumises par les organisations et les personnes en cause à leurs gouvernements respectifs.

Ha de hacerse notar que la majoria de las contribuciones de carácter nacional a los preparativos para la conferencia fueron efectuados por las organizaciones y los particulares interesados a sus gobiernos nacionales.

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| 6.7 | International Institute for Environmental Affairs (New York, USA, Etats-Unis d'Amérique, EE.UU.) | The human environment : science and international decision-making (based on the International Environmental Workshop, Aspen, Colorado (USA), 20 June - 6 August 1971, co-sponsored with The Aspen Institute for Humanistic Studies) | E<br>32 pp. | VI |
| 6.8 | T.A. Margerison (UK, Royaume-Uni, Reino Unido) | The role of public information in environmental policy | E<br>37 pp. | IV |
| 6.9 | Massachusetts Institute of Technology (MIT) (USA, Etats-Unis d'Amérique, EE.UU.) | Inadvertent climate modification: Report of the Study of Man's Impact on Climate (SMIC); sponsored by MIT and hosted by the Royal Swedish Academy of Sciences and the Royal Swedish Academy of Engineering Sciences; July 1971 | E<br>329 pp. | III |
| 6.10 | | Man's impact on the global environment, assessment and recommendations for action; Report of the Study of Critical Environmental Problems (SCEP); sponsored by MIT; July 1970 | E<br>314 pp. | Gen. |
| 6.11 | National Parks and Conservation Association (USA, Etats-Unis d'Amérique, EE.UU.) | Permanent institutions within the United Nations for the protection of the human environment - a preliminary proposal | E<br>12 pp. | VI |
| 6.12 | National Pure Water Association (UK, Royaume-Uni, Reino Unido | Prevention of water pollution; May 1971 | E<br>6 pp. | II/III |
| 6.13 | Smithsonian Institution (Washington, D.C., USA, Etats-Unis d'Amérique, EE.UU.) | The establishment of an international environmental monitoring program - a plan for action; R. Citron, Office of Environmental Sciences; May 1971 | E<br>75 pp. | III |

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|---|---|---|---|---|
| 6.14 | The American University (Washington, D.C., USA, Etats-Unis d'Amérique, EE.UU.) | Comprehensive environmental education : a means for inclusion of environmental and ecological principles in university education; Dr. Martha C. Sager, Director, Institute for Environmental Systems Analysis and Management | E<br>26 pp. | IV |
| 6.15 | University of Wisconsin-Green Bay (USA, Etats-Unis d'Amérique, EE.UU.) | Educational aspects of environmental issues; E.W. Weidner, Chancellor (incl. bibliographical note by J.E. Zipperer) | E<br>27 pp. | IV |
| 6.16 | University of Wisconsin-Green Bay (USA, Etats-Unis d'Amérique, EE.UU.) | Environmental education at the University of Wisconsin-Green Bay : a case study; E.W. Weidner, Chancellor; May 1971 | E<br>29 pp. | IV |

D(7) Draft position papers[1]
Projets de rapports de situation[1]
Proyectos de documentos de posición[1]

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|---|---|---|---|---|
| 7.1 | R.N. Gardner | The international organizational implication of action proposals - first draft; 5 July 1971 | E<br>34 pp. | VI |
| 7.2 | C. Garnier | Dimensions socio-culturelles des politiques de l'environement; août 1971 | F<br>70 pp. | IV |
| 7.3 | B.D.G. Johnson | The international organizational implications of action proposals - third draft; 26 November 1971 | E<br>69 pp. | VI |
| 7.4 | P. Johnson-Marshall | Planning and management of human settlements for environmental quality; Edinburgh 1971 | E<br>131 pp. | I |
| 7.5 | J. Ludwigson | Environmental aspects of natural resource management - second draft; Washington, D.C., October 1971 | E<br>103 pp. | II |
| 7.6 | N. Moore | Identification and control of pollutants and nuisances | E<br>71 pp.<br>+ 1 fig. | III |

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[1] These draft position papers were prepared by consultants on the basis of basic documents received by the Conference secretariat. These papers constituted major inputs to the official Conference documents on subject areas I - VI. It will be recalled that it was at one time planned to publish a position paper on each subject area separately from the action paper on each area but that it was later decided to combine the two concepts and to have only one document for each subject area.

Elaborés par des consultants à partir des documents de base reçus par le secrétariat de la Conférence, ce sont les principales sources des documents officiels de la Conférence relatifs aux thèmes I à VI. On se souvient qu'à l'origine il avait été envisagé de publier, à propos de chaque thème, un rapport de situation distinct du mémorandum d'action mais que par la suite il a été décidé de fusionner les deux notions et de ne publier qu'un seul document sur chaque thème.

Estos proyectos de documentos de posición han sido preparados por consultores, a base de documentos básicos recibidos por la secretaría de la Conferencia. Constituyen las principales aportaciones a la documentación oficial de la Conferencia sobre las materias de estudio I a VI. Se recordara que en un momento dado se habia proyectado publicar un documento de posición sobre cada materia de estudio a base del documento de acción correspondiente a la misma, pero posteriormente se decidió combinar ambos conceptos preparar un solo documento sobre cada materia de estudio.

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|---|---|---|---|---|
| 7.7 | G. Oldham | The environmental aspects of natural resources management - first draft | E<br>78 pp. | II |
| 7.8 | D. Wightman | The international organizational implications of action proposals - second draft | E<br>39 pp. | VI |

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CONFERENCE ON THE HUMAN ENVIRONMENT
Stockholm, 5-16 June 1972

## INFORMATION ON CONFERENCE DOCUMENTS

### Note by the Secretary-General

Attached to this note is a provisional list of the official Conference documents, which are being submitted for consideration by participants in the Conference, and of information documents.

All official Conference documents except A/CONF.48/2, "Annotations to the provisional agenda" and A/CONF.48/4, "Draft declaration on the human environment", are being issued simultaneously with the present note. The two outstanding documents cannot be completed until the Preparatory Committee at its fourth session (New York, 6 March 1972) will have considered the arrangements for the Conference and the progress of work on the draft declaration on the human environment.

It is expected that an addendum will be issued to document A/CONF.48/11 containing any recommendations resulting from the fourth session of the Preparatory Committee concerning the international organizational implications of action proposals. Addenda will also be issued to document A/CONF.48/15 to complete and, if necessary, bring up to date the Conference bibliography.

Further documents may be issued as appropriate in the A/CONF.48/.. series (in particular such draft conventions as may be ready for consideration by the Conference) and in the A/CONF.48/INF. series.

## Provisional list of Conference documents

### Official Conference documents

A/CONF.48/1 - Provisional agenda

A/CONF.48/2*/ - Annotations to the provisional agenda

A/CONF.48/3 - Provisional rules of procedure

A/CONF.48/4*/ - Draft declaration on the human environment

A/CONF.48/5 - An action plan for the human environment

A/CONF.48/6 - Planning and management of human settlements for environmental quality (subject area I)

A/CONF.48/7 - Environmental aspects of natural resources management (subject area II)

A/CONF.48/8 - Identification and control of pollutants of broad international significance (subject area III)

A/CONF.48/9 - Educational, informational, social and cultural aspects of environmental issues (subject area IV)

A/CONF.48/10 - Development and environment (subject area V)

A/CONF.48/11**/ - International organizational implications of action proposals (subject area VI)

A/CONF.48/12 - Consolidated document on the United Nations system and the human environment, submitted by the ACC

A/CONF.48/13**/ - Conference bibliography

### Information documents

A/CONF.48/INF.1 - Information on Conference documents

A/CONF.48/INF.2 - Recommendations for action

A/CONF.48/INF.3*/ - List of abbreviations

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CONFERENCE ON THE HUMAN ENVIRONMENT

Stockholm, 5-16 June 1972

## RECOMMENDATIONS FOR ACTION

### Note by the Secretary-General

1. This information paper is, in essence, an annex to "An action plan for the human environment". 1/ It consolidates and brings together in one paper the various recommendations for action in the first five subject areas. Recommendations relating to organizational aspects will only take shape after discussions at, and in the light of recommendations of, the Fourth Session of the Preparatory Committee (New York, 6-17 March 1972). There are three sections to this paper:

I. Recommendations for international action - arranged according to the framework proposed in "An action plan for the human environment", Chapter IV. In effect, this section will show how the proposed action plan would appear if all these recommendations were approved in their present form.

II. Proposed recommendations for national action - which are referred to Governments for their consideration (but which the Conference is not expected to consider in detail), plus national aspects of recommendations for international action (I. above).

III. How proposed recommendations address needs - an analysis of how the recommendations relate to the needs for major areas of concern.

2. It should be kept in mind that all recommendations for international action will be considered by Governments at the Stockholm Conference, and it must be assumed, therefore, that they will be modified before final approval for inclusion in the action plan.

3. The actual recommendations which will be formally before Governments at the Conference are contained in the subject area reports. Many of the recommendations that follow have been abridged; they contain the major points made in the subject area reports, which should be referred to for the complete text. The notations in the left-hand (parts I and II) or right-hand (part III) margin refer to the subject area and paragraph numbers. For example, recommendation II-47 refers to paragraph 47 report on subject area II Environmental Aspects of Natural Resources Management. 2/

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1/ A/CONF.48/5, paragraph 62.

2/ A/CONF.48/7.

4. For ease of reference, the symbol, of reports for each subject area are reproduced below:

| | | |
|---|---|---|
| Subject area I | Planning and management of human settlements for environmental quality | A/CONF.48/6 |
| " " II | Environmental aspects of natural resources management | A/CONF.48/7 |
| " " III | Identification and control of pollutants of broad international significance | A/CONF.48/8 |
| " " IV | Educational, informational, social and cultural aspects of environmental issues | A/CONF.48/9 |
| " " V | Development and environment | A/CONF.48/10 |
| " " VI | International organizational implications of action proposals | A/CONF.48/11 |

## I. RECOMMENDATIONS FOR INTERNATIONAL ACTION

1. This paper suggests how the proposed action plan would appear if all existing recommendations for international action were approved by the Conference in their present form, and were assembled according to the proposed framework for environmental action.[1]

FRAMEWORK FOR ENVIRONMENTAL ACTION

ENVIRONMENTAL ASSESSMENT

Evaluation and review
Research
Monitoring
Information exchange

↔

ENVIRONMENTAL MANAGEMENT

Goal setting and planning
International consultations and agreements

↑

SUPPORTING MEASURES

Education and training
Public information
Organization
Financing
Technical co-operation

2. It is hoped this presentation will assist governments in deciding on priorities they wish to stress, and also in identifying areas which they feel require strengthening or further modification.

3. When recommendations pertain to more than one of the functions specified in the framework they are shown under each function.

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[1] A/CONF.48/5, Chapter IV, paragraph 62.

## A. Environmental assessment

### (i) Evaluation and review

It is recommended that:

I - 140 Governments and the Secretary-General, the latter in consultation with the appropriate United Nations agencies, take the following steps:

- entrust the overall responsibility for coordinating environmental research to any central body that may be given the coordinating authority in the field of the environment;

- identify, wherever possible, an existing agency within the United Nations system as the principal focal point for initiating and coordinating research in each principal area and, where there are competing claims, establish appropriate priorities...

I - 150 Governments and the Secretary-General implement a plan of action designed to reduce losses from natural disasters including: the intensive application of science and technology to the control and mitigation of natural disasters; pre-disaster planning and preparedness; and the strengthening of international machinery, and of international cooperation, during and after the occurrence of natural disasters.

I - 154 The Secretary-General ensure that during the preparations for the 1974 World Population Conference, special attention be given to population concerns as they relate to the environment and, more particularly, to the environment of human settlements.

II - 133 Governments, the United Nations, FAO and other UN organizations concerned, as well as development assistance agencies, ensure international cooperation in the research, control and regulation of the side effects on aquatic resources of national activities in resource utilization where these affect the resources of other nations.

II - 134 Governments, the United Nations, FAO and other UN organizations concerned, as well as development assistance agencies, further develop and strengthen facilities for collecting, analysing and disseminating data on living aquatic resources and the environment in which they live.

II - 160 (c) The Secretary-General establish a roster of experts who would be available to assist governments, upon request, to anticipate and evaluate the environmental effects of major water development projects.

II - 160 (d) The Secretary-General prepare a comprehensive assessment and evaluation of the actual and potential environmental effects of water management upon the oceans.

II - 201 (a) The Secretary-General, in cooperation with governments concerned, arrange that systematic post audits of completed natural resource development projects be undertaken in representative ecosystems of international significance.

II - 201 (b) The Secretary-General, in cooperation with governments concerned, provide that pilot studies be conducted in representative ecosystems of international significance.

II - (b) The Secretary-General take steps to ensure that international development
203 assistance agencies, in cooperation with recipient governments, intensify efforts to revise and broaden the criteria of development project analysis to incorporate environmental impact considerations.

III - Governments be especially mindful of activities in which there is an appreciable
218 risk of effect on climate, and,

- carefully evaluate the likelihood and magnitude of climatic effects and disseminate their findings before embarking on such activities;
- consult fully other interested States when activities carrying a risk of such effects are being contemplated or implemented.

III - Governments actively support and contribute to international programmes to acquire
222 knowledge for the assessment of pollutant sources, pathways, exposures and risks...

III - The Secretary-General, drawing on the resources of the entire United Nations
223 system, and with the active support of Governments and appropriate scientific and other international bodies:

- increase the capability of the United Nations system to provide awareness and advance warning of deleterious effects to human health and well-being from man-made pollutants.

III - Any intergovernmental mechanism which may be established within the United Nations
232 in connexion with environmental problems should include among its functions:

(a) determination of which pollution problems are of international significance;

(b) consideration of the appointment of appropriate intergovernmental expert bodies to assess quantitatively the exposures, risks, pathways and sources of pollutants of international significance;

(c) review and coordination of international cooperation for pollution control, ensuring in particular that needed measures are taken and that measures taken in regard to various media and sources are consistent with each other;

III - The Secretary-General, together with the sponsoring agencies, make it possible for
235 GESAMP to:

(a) re-examine annually, and revise as required, its Review of Harmful Chemical Substances with a view to further elaborating its qualitative assessment of risks, pathways and sources of main pollutants;

(b) Assemble scientific data and develop a set of scientific considerations to be taken into account in the regulations of ocean dumping and continue its comparison of national marine water quality standards.

III - 238 IOC ensure that provisions are made in international marine research and monitoring activities for dissemination of information in a form usable by Governments, with attention paid to the special needs of developing countries, and consider, with FAO, the need for expansion of existing data centres to fulfil anticipated needs, with emphasis on referral systems.

III - 239 (b) The Secretary-General, with the support of FAO, IAEA and UNIDO and WHO consider providing guidelines to Governments for the control of all significant sources of marine pollution, including especially land-based sources, including recommendations as to the best practicable means.

III - 240 (b) The Secretary-General take steps to secure additional financial support to those training and other programmes of assistance that contribute to increasing the capacity of developing countries to participate in international research and monitoring programmes.

IV - 111 The Secretary-General should make arrangements:

- for the United Nations system to provide countries on request with the necessary technical assistance in preparing national reports on the environment, in setting up machinery for monitoring environmental developments from the social and cultural standpoint and, in particular, in drawing up national social and economic programmes;

- to study the desirability of a project for continuing co-operation among national social and economic programmes in an international network. The organizations of the United Nations system, including the regional economic commissions, would be called upon to participate in this activity, and so would other international governmental and non-governmental agencies;

- to organize the exchange of information on experience, methods and work in progress in connexion with the continuous social diagnosis, particularly at the regional level and between regions with common problems;

- to prepare, on the basis of the national reports on the state of and outlook for the environment, periodic reports on regional or sub-regional situations and on the international situation in this matter.

The activities described above could be co-ordinated by the new bodies for environmental coordination.

V - 36 The Secretary-General in consultation with appropriate international agencies, undertake a full review of the practical implications of environmental concerns in relation to distribution of future industrial capacity and, in particular, to ways in which the developing countries may be assisted to take advantage of opportunities and to minimize risks in those areas.

V - 40 The Secretary-General in collaboration with appropriate international agencies take steps to ensure that the environmental considerations set out here be taken into account during the review and appraisal of the International Development Strategy for the Second Development Decade.

(ii) Research

I - 140 Governments and the Secretary-General, the latter in consultation with the appropriate United Nations agencies, take the following steps:

- entrust the overall responsibility for coordinating environmental research to any central body that may be given the coordinating authority in the field of the environment;

- identify, wherever possible, an existing agency within the United Nations system as the principal focal point for initiating and coordinating research in each principal area and, where there are competing claims, establish appropriate priorities; designate the following as priority areas for research: theories, policies and methods of comprehensive environmental development; water supply, sewage and waste disposal, particularly in semi-tropical and tropical regions; problems of transitional settlements including socio-economic factors of rural-urban migrations; environmental socio-economic indicators to measure the condition of human settlements and to identify, over time, trends in their development; alternative methods of meeting urban transportation needs, psycho-social stresses in urban conglomerates.

I - 141 Governments consider cooperative arrangements to undertake the necessary research whenever the above problem areas have a specific regional impact....

I - 150 Governments and the Secretary-General implement a plan of action designed to reduce losses from natural disasters including research on earthquakes, tsunami, floods, storms, etc.

II - 46 FAO, in cooperation with other international agencies concerned, strengthen the necessary machinery for international acquisition of knowledge on soil capabilities, degradation, and conservation.

II - 66 (a) The Secretary-General take steps to ensure that the United Nations bodies concerned cooperate to meet the needs for new knowledge on forest management.

II - 67 (a) FAO coordinate an international programme for research and exchange of information on forest fires, pests, and diseases.

II - 116 Governments, in cooperation with the Secretary-General and FAO where indicated, cooperatively establish and properly fund a few large regional collections of micro-organism germ plasms.

II - 119 Governments, in cooperation with the Secretary-General and FAO where indicated, collaborate to establish a global network for genetic resources of national and regional institutes based on agreements on the availability of material and information; on methods, on technical standards and on the need for technical and financial assistance wherever required.

II - 133 Governments, the United Nations, FAO and other UN organizations concerned, as well as development assistance agencies, ensure international cooperation in the research of the side effects on aquatic resources of national activities in resource utilization where these affect the resources of other nations.

II - 134 Governments, the United Nations, FAO and other UN organizations concerned, as well as development assistance agencies, further develop and strengthen facilities for collecting, analysing and disseminating data on living aquatic resources and the environment in which they live.

II - 160 (a) The Secretary-General ensure that appropriate UN bodies support government action where required on water resource management, particularly by establishing regional specialized water centres.

II - 160 (b) The Secretary-General ensure that the United Nations system is prepared to provide technical and financial assistance to governments when requested in the different functions of water resources management.

II - 196 (c) The Secretary-General ensure that a study be undertaken on available energy sources and consumption trends in order to plan for and forecast the environmental effects of future use.

II - 203 (c) The Secretary-General ensure that a study on the relative costs and benefits of synthetic and natural products serving identical end uses be launched.

II - 203 (d) The Secretary-General ensure that the international programme of biosphere research be vigorously pursued.

II - 204 WMO initiate or intensify studies on the interrelationships of resource development and meteorology.

III - 222 Governments actively support and contribute to international programmes to acquire knowledge for the assessment of pollutant sources, pathways, exposures and risks and that those Governments in a position to do so provide educational, technical and other forms of assistance to facilitate broad participation by all countries.

III - 224 WHO undertake a major effort to develop ... epidemiological and environmental research programmes providing data for early warning of the deleterious effects of the various environmental agents to which man is increasingly exposed ...

III - 226 Internationally coordinated programmes of research and monitoring of food contamination by chemical and biological agents be established and developed jointly by FAO and WHO and that the results of monitoring be expeditiously assembled, evaluated and made available so as to provide early warning of rises in contamination.

III - 227 WMO guide and coordinate monitoring programmes, including:

(a) approximately ten baseline stations be set up in areas remote from all sources of pollution, to monitor long-term global trends in atmospheric constituents and properties, which may cause changes in climate;

(b) a much larger network of not less than a hundred stations be set up for monitoring air quality on a regional basis and especially changes in the distribution and concentration of contaminants;

(d) WMO, in cooperation with ICSU, continue to carry out the Global Atmospheric Research Programme (GARP), and if necessary establish new programmes, to better understand the general circulation of the atmosphere and the causes of climatic changes.

III - The Secretary-General ensure that:
228

(a) research activities in terrestrial ecology be encouraged, supported and co-ordinated through the appropriate agencies, so as to gain adequate knowledge of the inputs, movements, residence times and ecological effects of pollutants identified as critical;

(b) regional and global networks of existing and, where necessary, new research centres, and biological reserves be designated or established within the framework of the MAP programme in all ecological regions, to facilitate intensive analysis of the structure and functioning of ecosystems under natural or managed conditions.

III - Governments provide information to the Secretary-General concerning their
231 experiences with pollution control activities, including legislative and administrative arrangements, technology, cost-benefit methodology, and that the Secretary-General make this information available to those who desire to benefit from the experience of others.

III - Any intergovernmental mechanism which may be established within the United Nations
232 in connexion with environmental problems should include among its functions:

(d) examination of the needs for technical assistance to Governments in the study of pollution problems, in particular those involving international distribution of pollutants.

III - Governments:
234

(a) support national research and monitoring efforts that contribute to agreed international programmes for research and monitoring in the marine environment, in particular GIPME and IGOSS;

III - (b) register the discharge of significant quantities of radioactive materials to
234 the oceans with IAEA, as well as cooperate with IAEA in the expansion of this registry to include all discharge of significant quantities of radioactive materials into the biosphere;

(c) provide to the United Nations, FAO and UNCTAD, as appropriate to the data-gathering activities of each, statistics on the production and use of toxic and persistent materials;

(d) expand their support to components of the United Nations system concerned with research and monitoring in the marine environment, especially IOC, in order that it can take on additional responsibilities for promotion and coordination of scientific services.

III - The Secretary-General, together with the sponsoring agencies, make it possible
235 for GESAMP to:

(a) re-examine annually, and revise as required, its Review of Harmful Chemical Substances with a view to further elaborating its qualitative assessment of risks, pathways and sources of marine pollutants;

(b) assemble scientific data and develop a set of scientific considerations to be taken into account in the regulation of ocean dumping and continue its comparison of national marine water quality standards.

III - The Secretary-General ensure that:
236

(a) mechanisms for combining world statistics on mining, production, processing, transport and use of potential marine polluyants are developed along with methods for identifying high priority marine pollutants based in part on such data;

(c) FAO, WHO, IOC and IAEA encourage studies of the effects of high priority pollutants on man and other organisms, with appropriate emphasis on chronic, low-level exposures;

III - (d) IOC, with FAO and WHO, explore the possibility of establishing an
236 international institute for tropical marine studies, which would undertake training as well as research.

III - (a) Any intergovernmental mechanism which may be established within the
240 United Nations in connexion with environmental problems should include among its functions overall responsibility for assuring that needed guidelines of this type are provided to Governments;

(b) the Secretary-General take steps to secure additional financial support to those training and other programmes of assistance that contribute to increasing the capacity of developing countries to participate in international research and monitoring programmes.

V - Regional organisations give full consideration to:
31

- preparing detailed plans for the study of major environmental problems faced by the countries of the region concerned as well as of the special problems of subregional and regional interest of the land locked and least developed countries of the region and of countries with coast lines particularly exposed to the risk of marine pollution; examining possible administrative, legal and technical solutions to such problems in terms of both preventive and remedial actions, including alternative approaches to development projects;

- establishing criteria, concepts and a terminology of the human environment through interdisciplinary efforts.

V - The Secretary-General, in consultation with governments and appropriate international agencies, study means by which technologies that protect and improve the environment may be made available to developing countries under conditions which encourage their wide distribution.

(iii) Monitoring

I - Governments and the Secretary-General implement a plan of action designed to
150 reduce losses from natural disasters including: the intensive application of science and technology to the control and mitigation of natural disasters; pre-disaster planning and preparedness; and the strengthening of international machinery, and of international cooperation during and after the occurrence of natural disasters.

II - (b) The Secretary-General ensure continuing surveillance of the world's forest
66 cover be provided for through the establishment of an appropriate monitoring system.

II - The Secretary-General ensure that the effects of pollutants upon wildlife are
81 considered, where appropriate, within environmental monitoring systems.

II - The Secretary-General ensure that a programme to expand present data gathering
82 processes so as to assess the total economic value of wildlife resource is established.

II - Governments, in cooperation with the Secretary-General and FAO where indicated
108 make inventories of genetic resources most endangered by depletion or extinction.

II - Governments, in cooperation with the Secretary-General and FAO where indicated,
119 collaborate to establish a global network of national and regional institutes based on agreements on the availability of material and information; on methods, on technical standards.

II - (a) The Secretary-General ensure proper collection, measurement and analysis of
196 data relating to the environmental effects of energy use and production within appropriate monitoring systems.

II - The Secretary-General, in cooperation wich interested governments, take the
207 necessary steps to develop further remote sensing techniques in order to implement resources surveys and to ensure that the use of remote sensing devices be shared, where appropriate.

III - Governments actively support and contribute to international programmes to
222 acquire knowledge for the assessment of pollutant sources, pathways, exposures and risks and that those Governments in a position to do so provide educational, technical and other forms of assistance to facilitate broad participation by all countries.

III - The Secretary-General, drawing on the resources of the entire United Nations
223 system, and with the active support of Governments and appropriate scientific and other international bodies:

- increase the capability of the United Nations system to provide awareness and advance warning of deleterious effects to human health and well-being from man-made pollutants.

III - WHO undertake a major effort to develop monitoring ... programmes providing data
224 for early warning of the deleterious effects of the various environmental agents to which man is increasingly exposed;

III - WHO, in collaboration with the relevant agencies, assist governments, particularly
225 those of developing countries, in undertaking biological and chemical monitoring of water and in establishing air monitoring stations in urban areas;

III - Internationally coordinated programmes of research and monitoring of food
226 contamination by chemical and biological agents be established and developed jointly by FAO and WHO and that the results of monitoring be expeditiously assembled, evaluated and made available so as to provide early warning of rises in contamination.

III - WMO guide and coordinate monitoring programmes, including:
227

(a) approximately ten baseline stations be set up in areas remote from all sources of pollution, to monitor long-term global trends in atmospheric constituents and properties, which may cause changes in climate;

(b) a much larger network of not less than a hundred stations be set up for monitoring air quality on a regional basis and especially changes in the distribution and concentration of contaminants;

(d) WMO, in co-operation with ICSU, continue to carry out the Global Atmospheric Research Programme (GARP), and if necessary establish new programmes, to better understand the general circulation of the atmosphere and the causes of climatic changes.

III - The Secretary-General ensure that:
228

(b) regional and global networks of existing and, where necessary, new research stations, research centres, and biological reserves be designated or established within the framework of the MAB programme in all major ecological regions, to facilitate intensive analysis of the structure and functioning of ecosystems under natural or managed conditions.

(c) the feasibility of using stations participating in the MAB programme for surveillance of the effects of pollutants on ecosystems be investigated;

(d) programmes such as MAB be used to the extent possible to monitor the accumulation of hazardous compounds in biological and abiotic material at representative sites and the effect of such accumulation on reproductive success and population size of selected species.

III - Governments:
234

(a) support national research and monitoring efforts that contribute to agreed international programmes for research and monitoring in the marine environment, in particular GIPME and IGOSS;

(d) expand their support to components of the United Nations system concerned with research and monitoring in the marine environment, especially IOC, in order that it can take additional responsibilities for promotion and coordination of scientific services.

III - IOC, in cooperation with other interested United Nations bodies, promote the
237 monitoring of marine pollution, preferably within the framework of IGOSS and develop methods for monitoring high priority marine pollutants in water, sediments and organisms, with advice from GESAMP on inter-comparability of methodologies.

III - (b) The Secretary-General take steps to secure additional financial support to
240 those training and other programmes of assistance that contribute to increasing the capacity of developing countries to participate in international research and monitoring programmes.

IV - The United Nations system provide countries on request with the necessary
III technical assistance ... in setting up machinery for monitoring environmental developments.

V - Regional organizations give full consideration to:
31

- establishing and disseminating information on the significant environmental problems of each region and the nature and result of steps taken to cope with them.

V - The Secretary-General ensure that appropriate steps be taken by the existing
33 United Nations organizations to identify the major threats toexports that stem from environmental concerns, the character and severity, and the remedial action that may be envisaged.

V - GATT and UNCTAD should consider undertaking to monitor, assess and regularly
34 report the emergence of tariff and non-tariff barriers to trade as a result of environmental policies.

V - The Secretary-General, in consultation with governments and appropriate
39 international agencies, study means by which technologies that protect and improve the environment may be made available to developing countries under conditions which encourage their wide distribution.

### (v) Information exchange

I - Governments designate to the Secretary-General areas in which they have committed
137 themselves (or are prepared to commit themselves) to a long-term programme of environmental improvement ... that may vary in size from a city block to a national region. Countries which are prepared to launch such a programme of environmental improvement should be prepared to ... share internationally all relevant information on the problems they encounter and the solutions they devise in developing these areas.

I - Governments consider cooperative arrangements to undertake the necessary research
141 whenever problems (related to human settlements) have a regional impact. In
such cases provision should be made for the exchange of information and research
findings with countries of other geographical regions sharing similar problems.

I - Governments arrange for the exchange of visits by those who are conducting
144 research in public or private institutions of their countries; and Governments
and the Secretary-General ensure that the exchange of information concerning
past and on-going research, experimentation and project implementation .....
be accelerated.

II - FAO, in cooperation with other international agencies concerned, strengthen the
46 necessary machinery for the transfer of experience on soil capabilities,
degradation, and conservation.

II - (a) The Secretary-General coordinate an international programme for research and
67 exchange of information on forest fires, pests, and diseases.

II - (b) FAO facilitate the transfer of information on forests and forest management.
67

II - The Secretary-General ensure that an appropriate mechanism exists for the
96 transfer of information on park legislation and planning and management techniques
developed in some industrialized countries which could serve as models to be made
available to any interested developing country.

II - Governments, in cooperation with the Secretary-General and FAO where indicated,
119 collaborate to establish a global network of national and regional institutes
based on agreements on the availability of material and information, on methods,
on technical standards, and on the need for technical and financial assistance
wherever required.

II - Governments, the United Nations, FAO and other UN organizations concerned, as
134 well as development assistance agencies, further develop and strengthen
facilities for disseminating data on living aquatic resources and the environment
in which they live.

II - (a) The Secretary-General ensure that appropriate UN bodies support government
160 action where required, particularly by establishing regional specialized water
centres.

II - (b) The Secretary-General ensure that the United Nations system is prepared to
160 provide technical and financial assistance to governments when requested in the
different functions of water resources management.

II - The Secretary-General provide the appropriate vehicle for the exchange of
175 information on the environmental considerations of mining.

II - (b) The Secretary-General ensure that a study be undertaken on available energy
196 sources and consumption trends in order to plan for and forecast the environmental
effects of future use.

III - The Secretary-General, drawing on the resources of the entire United Nations
223 system, and with the active support of Governments and appropriate scientific and other international bodies:

- increase the capability of the United Nations system to provide awareness and advance warning of deleterious effects to human health and well-being from man-made pollutants;

- provide this information in a form which is useful to policy makers at the national level;

III - Governments provide information to the Secretary-General concerning their
231 experiences with pollution control activities, including legislative and administrative arrangements, technology, cost-benefit methodology, and that the Secretary-General make this information available to those who desire to benefit from the experience of others.

III - IOC ensure that provisions are made in international marine research and
238 monitoring activities for dissemination of information in a form usable by governments, with attention paid to the special needs of developing countries and consider, with FAO, the need for expansion of existing data centres to fulfil anticipated needs, with emphasis on referral systems.

IV - The Secretary-General make arrangements for the United Nations system ...... to
111 organize the exchange of information on experience, methods and work in progress on continuous social diagnosis, particularly at the regional level and between regions with common problems;

IV - The exchange of information on systems for teaching environmental subjects and,
114 in particular, the dissemination of the results of educational experiments are an essential feature of such international cooperation.

IV - The Secretary-General should make arrangements: to be kept informed of national
126 pilot schemes for new forms of environmental management; ...... and to organise the international exchange of information collected on this subject.

IV - The Secretary-General take action to implement an International Referral Service
137 for sources of environmental information.

V - Regional organizations give full consideration to:
51

- increasing and facilitating the flow of information and experience to member countries through global and regional cooperation with particular emphasis on an international information referral centre approach;

- establishing facilities for the exchange of information and experience between less industrialized countries which, although situated in different regions, share similar problems as a result of common physical, climatic and other factors;

- establishing and disseminating information on the significant environmental problems of each region and the nature and result of steps taken to cope with them;

- providing and coordinating technical assistance activities directed at establishing systems of environmental research, information and analysis at the national level.

V - The Secretary-General, in consultation with governments and appropriate
39 international agencies, study means by which technologies that protect and
improve the environment may be made available to developing countries under
conditions which encourage their wide distribution.

## B. Environmental Management

I - 136 All development assistance agencies, whether international, such as UNDP and IBRD, regional or national, give high priority to responding to requests of governments for assistance in the field of human settlements, notably in housing, transportation, water and sewage problems, the mobilization of national human and financial resources and the improvement of transitional urban settlements; and these agencies should also be prepared to assist the less-industrialized countries to take account of the environmental problems of development projects; to this end, they should recruit appropriate environmental staff.

I - 137 Governments designate to the Secretary-General areas in which they have committed themselves (or are prepared to commit themselves) to a long-term programme of environmental improvement....

I - 138 The attention of governments be drawn to the need to consult bilaterally or regionally whenever environmental conditions or development plans in one country could have repercussions in one or more neighbouring countries.

I - 152 WHO increase its effort to support governments in planning for improving water supply and sewerage services through its community water supply programme.

I - 153 Development assistance agencies give higher priority to supporting governments in the financing and implementation of water supply and sewerage services as part of the objectives of the United Nations Second Development Decade.

II - 47 Governments, FAO and WHO, in co-operation with UNESCO and IAEA, strengthen and co-ordinate international programmes for integrated pest control and reduction of the harmful effects of agro-chemicals.

II - 48 FAO under its programme "War on Waste" place increased emphasis on control and recycling of wastes in agriculture.

II - 67 (b) The Secretary-General facilitate the transfer of information on forests and forest management.

II - 84 Governments give attention to the need to enact international conventions and treaties to protect species inhabiting international waters or those which migrate from one country to another.

II - 85 Governments move to agree to the proposed convention on the export, import, and transit of certain species of wild animals and plants.

II - 86 Governments agree to strengthen the International Whaling Commission and to consider an international agreement calling for a 10-year moratorium on commercial whaling.

II - 97 Governments and the Secretary-General ensure that the appropriate UN agencies assist the developing countries to plan for the inflow of visitors into their protected areas, in such a way as to reconcile revenue and environmental considerations.

II - (a) Governments take steps to co-ordinate and co-operate on the management of
98 shared protected areas.

(b) Governments move to agree on the proposed conventions on conservation of certain islands for science, and conservation of the world heritage.

(c) Governments take steps to set aside areas representing eco-systems of international significance for protection under international agreement.

II - Interested governments - which have not yet done so - sign and ratify the convention
99 on conservation of wetlands of international importance, approved at the Conference of Ramsar (Iran).

II - Governments agree to an international programme to preserve the world genetic
107 resources. Active participation at the national and international levels is involved in six interrelated areas: survey of genetic resources; inventory of collections; exploration and collecting; documentation; evaluation and utilization; and conservation.

II - Governments, in co-operation with the Secretary-General and FAO, recognize that
111 conservation is a most crucial part of any programme of genetic resources.

II - Governments, in co-operation with the Secretary-General and FAO where indicated,
116 co-operatively establish and properly fund a few large regional collections of micro-organism germ plasms.

II - Governments, in co-operation with the Secretary-General and FAO where indicated,
118 act with the understanding that evaluation and utilization are critical corollaries to the conservation of genetic resources.

II - Governments, in co-operation with the Secretary-General and FAO where indicated
119 collaborate to establish a global network of national and regional institutes based on agreements on the availability of material and information; on methods and on technical standards.

II - Governments, in co-operation with the Secretary-General and FAO where indicated,
120 implement certain institutional innovations in order to answer the need for liaison among the parties participating in the global system of genetic resources conservation.

II - Governments, the United Nations, FAO and other UN organizations concerned, as well
131 as development assistance agencies support recent guidelines, recommendations and programmes of the various international fishing organizations.

II - Governments, the United Nations, FAO and other UN organizations concerned as well
132 as development assistance agencies, ensure close participation of fishery agencies and interests in the preparations for the UN Conference on the Law of the Sea.

II - 133 Governments, the United Nations, FAO and other UN organizations concerned, as well as development assistance agencies, ensure international co-operation in the control and regulation of the side effects on aquatic resources of national activities in resource utilization where these affect the resources of other nations.

II - 135 Governments, the United Nations, FAO and other UN organizations concerned, as well as development assistance agencies, ensure full co-operation among governments by strengthening the existing international and regional machinery for development and management of fisheries and their related environmental aspects, and in those regions where these do not exist, encourage the establishing of fishery councils and commissions as appropriate.

II - 159 Governments concerned consider the creation of appropriate multinational institutions in the form of international river-basin commissions, for water resources common to more than one jurisdiction.

II - 160 (a) The Secretary-General ensure that appropriate UN bodies support government action where required, particularly by establishing regional specialized water centres.

(b) The Secretary-General ensure that the United Nations system is prepared to provide technical and financial assistance to governments when requested in the different functions of water resources management.

(c) The Secretary-General establish a roster of experts who would be available to assist governments, upon request, to anticipate and evaluate the environmental effects of major water development projects.

(d) The Secretary-General prepare a comprehensive assessment and evaluation of the actual and potential environmental effects of water management upon the oceans.

II - 201 (b) The Secretary-General, in co-operation with governments concerned, provide that pilot studies be conducted in representative eco-systems of international significance to assess the environmental impact of alternative approaches to the survey, planning, and development of resource projects.

II - 203 (b) The Secretary-General ensure that international development assistance agencies, in co-operation with recipient governments, intensify efforts to revise and broaden the criteria of development project analysis to incorporate environmental impact considerations.

II - 227 (b) FAO expand its present programme on the stabilization of marginal lands.

III - 218 Governments be especially mindful of activities in which there is an appreciable risk of effect on climate, and,

- carefully evaluate the likelihood and magnitude of climate effects and disseminate their findings before embarking on such activities;

- consult fully other interested states when activities carrying a risk of such effects are being contemplated or implemented;

III - 219 Governments use the best practicable means available to minimize the release to the environment of persistent and toxic substances, particularly heavy metals and organochlorine compounds, until it has been demonstrated that their release will not cause adverse effects or unless their use is essential to human health or food production, in which case appropriate control measures should be applied;

III - 220 In establishing standards for pollutants of international significance, Governments take into account the relevant standards proposed by competent international organizations, and concert with other concerned governments and the competent international organization in planning and carrying out control programmes for pollutants distributed beyond the national jurisdiction from which they are released;

III - 221 Governments avoid creating barriers to international trade to off-set the costs of pollution control and that they consult with other concerned governments, even though there may be no legal obligation to do so, with a view to avoiding the creation of non-tariff barriers due to variations in national standards for goods or for the transport or use of goods.

III - 229 Increased support be given to the Codex Alimentarius Commission to develop international standards for pollutants in food and a code of ethics for international food trade.

III - 230 WHO, in conjunction with the appropriate United Nations agencies, derive working limits for common air and water contaminants.

III - 231 Governments provide information to the Secretary-General concerning their experiences with pollution control activities, including legislative and administrative arrangements, technology, cost-benefit methodology, and that the Secretary-General make this information available to those who desire to benefit from the experience of others.

III - 232 Any intergovernmental mechanism which may be established within the United Nations in connexion with environmental problems should include among its functions

(c) - review and co-ordinate international co-operation for pollution control, ensuring in particular that needed measures are taken and that measures taken in regard to various media and sources are consistent with each other.

(d) - examination of the needs for technical assistance to Governments in the study of pollution problems, in particular those involving international distribution of pollutants.

III - Governments
233

(a) - accept and implement existing instruments on the control of the maritime sources of marine pollution;

III - (b) - ensure that the provisions of existing instruments are complied with by
233 ships flying their flags ~~and that~~ adequate provisions are made for reviewing the effectiveness of, and revising,

(c) - ensure that ocean dumping by their nationals is controlled and complete and bring into force as soon as possible an over-all instrument for the control of ocean dumping, as well as needed regional agreements within the framework of this instrument.

(d) - participate fully in the 1973 IMCO Conference on Marine Pollution and the Law of the Sea Conference scheduled to begin in 1973, as well as in regional efforts, with a view to bringing all significant sources of pollution within the marine environment under appropriate controls;

(e) - strengthen national controls over land-based sources of marine pollution.

III - The Secretary-General, together with the sponsoring agencies, make it possible
235 for GESAMP to:

(a) - re-examine annually, and revise as required, its Review of Harmful Chemical Substances with a view to further elaborating its qualitative assessment of risks, pathways and sources of main pollutants;

III -
239 (a) Governments collectively endorse the principles set forth in paragraph 197 as guiding concepts representing a basis for general agreement, in particular at the 1973 IMCO Conference on Marine Pollution and at the Law of the Sea Conference scheduled to begin in 1973;

(b) The Secretary-General, with the support of FAO, IAEA and UNIDO, consider providing guidelines to governments for the control of all significant sources of marine pollution, including especially land-based sources, including recommendations as to the best practicable means.

III - (a) Any intergovernmental mechanism which may be established within the United
240 Nations in connexion with environmental problems should include among its functions over-all responsibility for assuring that needed guidelines of this type are provided to Governments.

III - (b) The Secretary-General take steps to secure additional financial support to
240 those training and other programmes of assistance that contribute to increasing the capacity of developing countries to participate in international research and monitoring programmes.

IV - International organizations for voluntary service and, in particular, the
116 International Secretariat for Volunteer Service include environmental skills in the services they provide, in consultation with UNDP through the United Nations Volunteer Corps.

IV - Governments with the assistance of the Secretary-General, FAO, UNESCO, and the
124 other international and regional intergovernmental and non-governmental agencies concerned, continue the preparation of the conventions required for the conservation of the world's natural resources and cultural heritage.

IV - Governments examine the following with a view to signature: draft convention on
125 conservation of the world heritage; draft convention on the protection of monuments, groups of buildings and sites; draft convention on conservation of wetlands of international importance; draft convention on conservation of certain islands for science; and draft convention on export, import and transit of certain species of wild animals and plants.

V - Regional organizations give consideration to:
31

- establishing criteria, concepts and a terminology of the human environment through interdisciplinary efforts;
- assisting developing countries in co-operation with appropriate international agencies, in developing and applying low cost methods for improving health, housing, sanitation and water supply. Emphasis should be devoted to labour intensive measures and methods utilizing local materials.

V - Governments take the necessary steps to ensure that:
32

- all countries present at the Conference agree not to invoke environmental concerns as a pretext for discriminatory trade policies or for reduced access to markets and recognize further that the burdens of the environmental policies of the developed countries should not be transferred, either directly or indirectly, to the developing countries;
- where environmental concerns lead to restrictions on trade, or stricter environmental standards with negative effects on exports, particularly from developing countries, appropriate measures for compensation should be worked out;
- the GATT could be used for the examination of the problems, specifically through the recently established Group on Environmental Measures and International Trade and through its general procedures for bilateral and multilateral adjustment of differences;

- whenever possible (i.e. in cases which do not require immediate discontinuation of imports), countries should inform their trading partners in advance about the intended action in order that there might be an opportunity to consult within the GATT Group on Environmental Measures and International Trade. Assistance in meeting consequences of stricter environmental standards ought to be given in the form of financial or technical assistance for research with the aim to remove the obstacles that the products of developing countries have encountered;

- all countries agree that uniform environmental standards should not be expected to be applied universally by all countries with respect to given industrial processes or products except in those cases where environmental disruption may constitute a concern to other countries. Environmental standards should be established at whatever levels are necessary, to safeguard the environment and should not be aimed at gaining trade advantages.

V 33 - The United Nations system assist governments in negotiating, in as many areas as possible, mutually acceptable international environmental standards on products so as to reduce the scope for arbitrary or discriminatory actions.

V 34 - That GATT and UNCTAD should consider undertaking to monitor, assess and regularly report the emergence of tariff and non-tariff barriers to trade as a result of environmental policies.

V 36 - Governments of the developing countries consider fully the new opportunities which may be offered to establish industries in which they may have comparative advantages due to environmental considerations, and that special care be taken in all such instances to avoid the creation of pollution problems in developing countries.

V 38 - The Secretary-General in collaboration with appropriate international agencies ensure that a study be conducted of appropriate mechanisms for financing international environmental action, taking into account the General Assembly resolution 2849 (XXVI).

V 39 - The Secretary-General, in consultation with governments and appropriate international agencies, study means by which technologies that protect and improve the environment may be made available to developing countries under conditions which encourage their wide distribution.

V 40 - The Secretary-General in collaboration with appropriate international agencies take steps to ensure that the environmental considerations set out here be taken into account during the review and appraisal of the International Development Strategy for the Second Development Decade.

## C. Supporting Measures

### (i) Education and training

I - 146 Governments and the Secretary-General give urgent attention to the problem of establishing facilities for the training of "integrators".

I - 148 Governments and the Secretary-General ensure that the institutions concerned be strengthened and that special training activities be established for the benefit of the less-industrialized countries, covering the following: intermediate and auxiliary personnel for national public services who, in turn, would be in a position to train others for similar tasks; specialists in environmental planning and in rural development; community developers for self-help programmes for low-income groups; specialists in working environments; planners and organizers of mass transport systems and services with special reference to environmental development.

I - 149 Regional institutions take stock of the requirements of their regions for various environmental skills and of the facilities available to meet these requirements in order to facilitate the provision of appropriate training within regions.

II - 83 The Secretary-General ensure that the appropriate UN agencies co-operate with the governments of the developing countries to develop special short-term training courses on wildlife management.

II - 95 Governments and the Secretary-General give special attention to training requirements for the management of parks and other protected areas.

III - 222 Governments actively support and contribute to international programmes to acquire knowledge for the assessment of pollutant sources, pathways, exposures and risks and that those Governments in a position to do so provide educational, technical and other forms of assistance to facilitate broad participation by countries regardless of their economic and technological advancement.

III - 236 (d) The Secretary-General ensure that IOC, with FAO and WHO, explore the possibility of establishing an international institute for tropical marine studies, which would undertake training as well as research.

III - 240 (b) The Secretary-General take steps to secure additional financial support to those training and other programmes of assistance that contribute to increasing the capacity of developing countries to participate in international research and monitoring programmes.

IV - 114 The Secretary-General, the organizations of the United Nations system, especially UNESCO, and other international agencies concerned, take the necessary steps to establish an international programme of technical and financial co-operation and assistance on general environmental education and on training of the necessary environmental specialists, technicians and teachers.

IV - 115 UNESCO, with a view toward environmental considerations, further study innovations in general education and in specialist training, and should encourage the institution of courses and training periods at the regional and international levels.

V - 31 Regional organizations give full consideration to:

- encouraging training of personnel in the techniques of incorporating environmental considerations into developmental planning, and of identifying and analysing the economic and social cost benefit relationships of alternative approaches;
- providing and co-ordinating technical assistance activities directed at establishing systems of environmental research, information and analysis at the national level.

(ii) Public information

IV - 119 The Secretary-General make arrangements to give the widest possible circulation to the preparatory documents and official documents of the Conference; to establish a programme of information on the environment, designed to assist States to inform their publics about current activities and the solutions applied to environmental problems; and to develop technical co-operation.

IV - 129 The Secretary-General and the development agencies make arrangements to use and adapt certain international development programmes to improve the dissemination of information and strengthen community action on environmental problems.

(iii) Organization

I - 140 Governments and the Secretary-General, the latter in consultation with the appropriate United Nations agencies, take the following steps:

- entrust the overall responsibility for co-ordinating environmental research to any central body that may be given the co-ordinating authority in the field of the environment;
- identify, wherever possible, an existing agency within the United Nations system as the principal focal point for initiating and co-ordinating research in each principal area and, where there are competing claims, establish appropriate priorities ......

I - 148 Governments and the Secretary-General ensure that the institutions concerned be strengthened and that special training activities be established for the benefit of the less-industrialized countries ......

I - Governments and the Secretary-General implement a plan of action designed to
150 reduce losses from natural disasters including: the intensive application of science and technology to the control and mitigation of natural disasters; pre-disaster planning and preparedness; and the strengthening of international machinery, and of international co-operation, during and after the occurrence of natural disasters.

II - (a) FAO co-ordinate an international programme for research and exchange of
67 information on forest fires, pests, and diseases.

II - Governments agree to strengthen the international whaling commission and to
86 consider an international agreement calling for a 10-year moratorium on commercial whaling.

II - Governments, in co-operation with the Secretary-General and FAO where indicated,
112 organize and equip national or regional genetic resources conservation centres.

II - Governments, in co-operation with the Secretary-General and FAO where indicated,
116 co-operatively establish and properly fund a few large regional collections of micro-organism germ plasms.

II - Governments, in co-operation with the Secretary-General and FAO where indicated,
117 establish conservation centres of insect germ plasm.

II - Governments, in co-operation with the Secretary-General and FAO where indicated,
120 implement certain institutional innovations in order to answer the need for liaison among the parties participating in the global system of genetic resources conservation.

II - Governments, the United Nations, FAO and other UN organizations concerned, as well
134 as development assistance agencies, further develop and strengthen facilities for collecting, analysing and disseminating data on living aquatic resources and the environment in which they live.

II - Governments, the United Nations, FAO and other UN organizations concerned, as well
135 as development assistance agencies, ensure full co-operation among governments by strengthening the existing international and regional machinery for development and management of fisheries and their related environmental aspects, and in those regions where these do not exist, encourage the establishing of fishery councils and commissions as appropriate.

II - Governments concerned consider the creation of appropriate multinational institutions
159 in the form of international river-basin commissions, for water resources common to more than one jurisdiction.

II - (a) The Secretary-General ensure that appropriate UN bodies support government
160 action where required, particularly by establishing regional specialized water centres.

III - 227 (a) Approximately ten baseline stations be set up in areas remote from all sources of pollution, to monitor long-term global trends in atmospheric constituents and properties, which may cause changes in climate;

(b) A much larger network of not less than one hundred stations be set up for monitoring air quality on a regional basis and especially changes in the distribution and concentration of contaminants;

III - 228 (b) The Secretary-General ensure that ....... regional and global networks of existing and, where necessary, new research stations, research centres, and biological reserves be designated or established within the framework of the MAB programme in all major ecological regions, to facilitate intensive analysis of the structure and functioning of ecosystems under natural or managed conditions;

III - 232 Any intergovernmental mechanism which may be established within the United Nations in connexion with environmental problems should include among its functions:

(a) - determination of which pollution problems are of international significance;

(b) - consideration of the appointment of appropriate intergovernmental, expert bodies to assess quantitatively the exposures, risks,

(c) - review and co-ordination of international co-operation for pollution control, ensuring in particular that needed measures are taken and that measures taken in regard to various media and sources are consistent with each other;

(d) - examination of the needs for technical assistance to governments in the study of pollution problems, in particular those involving international distribution of pollutants.

III - 238 IOC ensure that provisions are made in international marine research and monitoring activities for dissemination of information in a form usable by Governments, with attention paid to the special needs of developing countries, and consider, with FAO, the need for expansion of existing data centres to fulfill anticipated needs, with emphasis on referral systems.

III - 240 (a) Any intergovernmental mechanism which may be established within the United Nations in connexion with environmental problems should include among its functions over-all responsibility for assuring that needed guidelines of this type are provided to Governments;

IV - 137 The Secretary-General take action to implement an International Referral Service for sources of environmental information, in order to assist in the successful implementation of most of those recommendations envisaged within the five substantive subject areas of the Conference agenda.

V - Regional organizations give full consideration to:
31

- establishing facilities for the exchange of information and experience between less industrialized countries which, although situated in different regions, share similar problems as a result of common physical, climatic and other factors;

- providing and co-ordinating technical assistance activities directed at establishing systems of environmental research, information and analysis at the national level; and

- assisting developing countries in co-operation with appropriate international agencies, in developing and applying low cost methods for improving health, housing, sanitation and water supply. Emphasis should be devoted to labour intensive measures and methods utilizing local materials.

(iv) Financing

I - All development assistance agencies, whether international, such as UNDP and IBRD,
136 regional or national, give high priority to responding to requests of governments
for assistance in the field of human settlements, notably in housing, transportation, water and sewage problems, the mobilization of national human and financial resources and the improvement of transitional urban settlements; and that these agencies also be prepared to assist the less-industrialized countries to take account of the environmental problems of development projects; to this end, they should recruit appropriate environmental staff.

I - Governments designate to the Secretary-General areas in which they have committed
137 themselves (or are prepared to commit themselves) to a long-term programme of
environmental improvement ...... Countries which are prepared to launch such a programme of environmental improvement should be prepared to: make long-term commitments of financial and other resources; welcome international co-operation through seeking the advice or assistance of competent international bodies .....

I - Development assistance agencies give higher priority to supporting governments
153 in the financing and implementation of water supply and sewerage services as
part of the objectives of the United Nations Second Development Decade.

II - Governments, in co-operation with the Secretary-General and FAO where indicated,
119 collaborate to establish a global network of national and regional institutes
based on agreements on the availability of material and information; on methods, on technical standards, and on the need for technical and financial assistance wherever required.

II - (b) The Secretary-General ensure that the United Nations system is prepared to
160 provide technical and financial assistance to governments, when requested, in the
different functions of water resources management.

III - Governments actively support and contribute to international programmes to acquire
222 knowledge for the assessment of pollutant sources, pathways, exposures and risks and that those governments in a position to do so provide educational, technical and other forms of assistance to facilitate broad participation by all countries regardless of their economic or technological advancement.

III - The Secretary-General drawing on the resources of the entire United Nations
223 system, and with the active support of Governments and appropriate scientific and other international bodies ....... develop means to assist those governments which desire to incorporate these and other environmental factors into national planning processes;

III - Any intergovernmental mechanism which may be established within the United Nations
232 in connexion with environmental problems should include among its functions

(d) - examination of the needs for technical assistance to governments in the study of pollution problems, in particular those involving international distribution of pollutants.

III - (b) The Secretary-General take steps to secure additional financial support to
240 those training and other programmes of assistance that contribute to increasing the capacity of developing countries to participate in international research and monitoring programmes.

IV - The Secretary-General make arrangements for the United Nations system to provide, on
111 request, the necessary technical assistance in preparing national reports on the environment, in setting up machinery for monitoring environmental developments ....

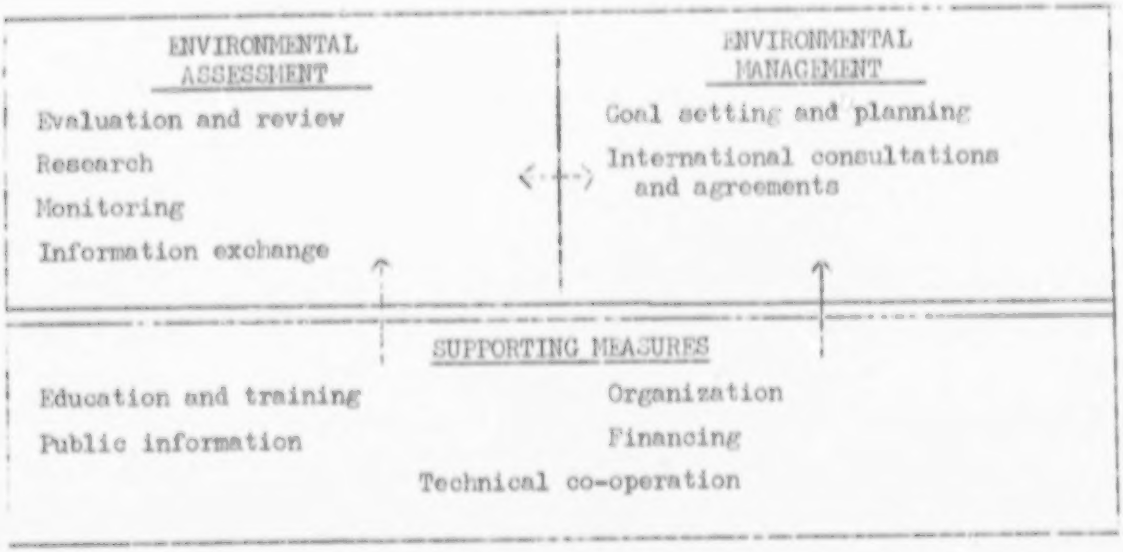
IV - The Secretary-General, the organizations of the United Nations system, especially
114 UNESCO, and other international agencies concerned, take the necessary steps to establish an international programme of technical and financial co-operation and assistance on general environmental education and on training of the necessary environmental specialists, technicians and teachers.

IV - The Secretary-General make arrangements to be kept informed of national pilot
126 schemes for new forms of environmental management; to assist countries, on request, with their experiments .....

V - The Secretary-General in collaboration with appropriate international agencies
38 ensure that a study be conducted of appropriate mechanisms for financing international environmental action, taking into account the General Assembly resolution 2849 (XXVI).

## II. NATIONAL ACTIONS

This paper sets forth national actions according to function. The functions are described in Chapter IV of the "Action plan for the human environment"[1]/containing the framework for environmental action:


ENVIRONMENTAL ASSESSMENT
Evaluation and review
Research
Monitoring
Information exchange
ENVIRONMENTAL MANAGEMENT
Goal setting and planning
International consultations and agreements
SUPPORTING MEASURES
Education and training
Public information
Organization
Financing
Technical co-operation

The purpose of this paper is purely informational; it aims at showing functionally the totality of recommendations for actions at the national level both for domestic consideration and in support of the action plan. Those recommendations which are a part of the action plan [2]/will be subject to further consideration by Governments and may therefore be changed considerably. This paper shows the national aspects of the Conference recommendations as they are contained in the subject area reports [2]/in their present form.

The recommendations which follow are of two sorts:

(a) those which are referred to Governments for their consideration for such actions as they deem appropriate but which the Conference will not be expected to consider in detail [3]/and

(b) recommendations for action by Governments which because of their international impact are included in the action plan, and which, therefore, may be further modified during Conference considerations.

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[1]/ A/CONF.48/5

[2]/ A/CONF.48/6 to 48/10

[3]/ See A/CONF.48/5, paragraph 63

## A. Environmental assessment

### (i) Evaluation and review

### (a) REFERRED TO GOVERNMENTS FOR THEIR CONSIDERATION AND SUCH ACTION AS THEY DEEM APPROPRIATE:

I - 134 (a) The adoption of a comprehensive environmental development approach to policy-making and implementation in the field of human settlements;

(b) the improvement of existing - or the establishment of new - legislative and institutional frameworks to render such an approach effective;

(c) the launching or further development of national population policies dealing with the growth and distribution of population in relation to the role, location and size of human settlements and in keeping with a rational use of resources;

(d) the assessment of urban and rural water supply and sanitation problems; the adoption and implementation of national policies to solve these problems; and the setting - and inclusion in national development plans - of specific annual targets designed to meet the objectives of the WHO water supply and sanitation programme for the United Nations Second Development Decade; and the creation of the necessary institutions and the training of skilled manpower for the planning and management of water supply and sanitation system.

II - 76 Methods for assessing the impact upon wildlife of building large-scale construction, of clearing and developing land, and of altering present forms of land use, should be devised and implemented.

II - 194 Each nation should also set up or, if they already exist, review the effectiveness of agencies to administer minimum standards in areas where accidents (in connexion with energy processing, transportation and consumption) must be controlled.

IV - 110 Periodic preparation of a national report on the state of and outlook for the environment, after careful study of the specific national needs for information on this subject and with due attention to the goals of economic planning and programming; the strengthening and co-ordination of action in progress with regard to: the institutional organization of environmental monitoring from the social and cultural standpoint; the setting of standards and criteria for the quality of life, after a forward-looking study, inter alia by inquiry, of the socially desirable minima for certain social, economic and cultural parameters and indicators of the environment; and an analysis of the conflicts between private interests and the public interest in the use of the environment and a study of institutions and planning methods for resolving such conflicts in the short and long term.

## (b) ACTIVITIES BY GOVERNMENTS CALLED FOR IN CONNEXION WITH RECOMMENDATIONS FOR INTERNATIONAL ACTION, FOR FURTHER CONSIDERATION BY THE CONFERENCE:

It is recommended that:

II - (a) Governments concerned should co-operate with the Secretary-General to
201 arrange that systematic post audits of completed natural resource development
projects be undertaken in representative ecosystems of international significance;

II - (b) Governments concerned should co-operate with the Secretary-General to
201 conduct pilot studies in representative ecosystems of international significance
to assess the environmental impact of alternative approaches to the survey,
planning, and development of resource projects.

II - (b) Recipient governments should co-operate with international development
203 assistance agencies to intensify efforts to revise and broaden the criteria of
development project analysis to incorporate environmental impact considerations.

III - Governments be especially mindful of activities in which there is an appreciable
218 risk of effect on climate, and,

(1)

(1) carefully evaluate the likelihood and magnitude of climatic effects and disseminate their findings before embarking on such activities,

(2) consult fully other interested States when activities carrying a risk of such effects are being contemplated or implemented.

III - Governments actively support and contribute to international programmes to
222 acquire knowledge for the assessment of pollutant sources, pathways, exposures
and risks and that those Governments in a position to do so provide educational,
technical and other forms of assistance to facilitate broad participation by
countries regardless of their economic or technical advancement.

V - Governments of the developing countries consider fully the new opportunities
36 which may be offered to establish industries in which they may have comparative
advantages due to environmental considerations, and that special care be taken
in all such instances to avoid the creation of pollution problems in developing
countries and that the Secretary-General in consultation with appropriate international agencies, undertake a full review of the practical implications of
environmental concerns in relation to distribution of future industrial capacity
and in particular, to ways in which the developing countries may be assisted
to take advantage of opportunities and to minimize risks in this area.

## (ii) Research

### (a) REFERRED TO GOVERNMENTS FOR THEIR CONSIDERATION AND SUCH ACTION AS THEY DEEM APPROPRIATE:

II - Governments should strengthen basic agricultural research to improve ecological
37 understanding.

II - Governments should direct their agricultural research services and field stations
38 to incorporate environmental considerations into their programmes of
investigation and experimentation.

II - Governments should undertake both basic and applied research for improved forest
62 planning and management.

II - Research is needed on habitat requirements (for wildlife).
79

II - Governments should initiate or extend applied research projects to assess the
80 interrelationships between forest and range management and wildlife populations.

II - Governments should engage in research on park management.
92

II - Fisheries research should be strengthened.
126

II - The required research institutions and related training facilities should be
130 established or strengthened to implement action proposals presented in
recommendation II-126 and to allow effective participation in the activities of
the regional and international fisheries bodies.

II - Governments should encourage the translation of laboratory investigations to
158 field practice regarding water resources.

II - Governments should redirect part of their often extensive mining research
171 programme to develop mining and processing methods that will avoid or reduce
these impacts during mining, to determine how to stabilize waste disposal sites,
and to search for ways in which the wastes can be put to beneficial use.

II - Countries should promote economic and technological research capabilities for
192 developing or assessing new energy systems or for determining the best or
improved use of existing systems.

IV - The strengthening and co-ordination of action in progress with regard to ... the
110 selection of social and cultural indicators of the environment ... (and) ... an
analysis of the conflicts between private interests and the public interest in
the use of the environment and a study of institutions and planning methods for
resolving such conflicts in the short and long term.

### (b) ACTIVITIES BY GOVERNMENTS CALLED FOR IN CONNEXION WITH RECOMMENDATIONS FOR INTERNATIONAL ACTION, FOR FURTHER CONSIDERATION BY THE CONFERENCE:

It is recommended that:

I - Governments ... take the following steps:
140

- entrust the overall responsibility for co-ordinating environmental research to any central body that may be given the co-ordinating authority in the field of the environment,

- identify, wherever possible, an existing agency within the United Nations system as the principal focal point for initiating and co-ordinating research in each principal area and, where there are competing claims, establish appropriate priorities;

- designate the following as priority areas for research:

  . theories, policies and methods of comprehensive environmental development

  . water supply, sewage and waste disposal, particularly in semi-tropical and tropical regions - (principal responsible agency: WHO)

  . problems of transitional settlements including socio-economic factors of rural-urban migrations - (principal responsible bodies: ESA (CHBP), WHO, ILO)

  . environmental socio-economic indicators to measure the condition of human settlements and to identify, over time, trends in their development

  . alternative methods of meeting urban transportation needs - (principal responsible bodies: ESA (Resources and Transport Division) and CHBP).

  . psycho-social stresses in urban conglomerates (Principal responsible agency: WHO).

I - Governments ... consider co-operative arrangements to undertake the necessary
141 research whenever the above problem areas have a specific regional impact. In such cases, provision should be made for the exchange of information and research findings with countries of other geographical regions sharing similar problems.

II - Governments ... co-operatively establish and properly fund a few large regional
116 collections of micro-organism germ plasms.

II - Governments ... collaborate to establish ... institutes (for genetic resources)
119 ... wherever required.

III - 222 Governments actively support and contribute to international programmes to acquire knowledge for the assessment of pollutant sources, pathways, exposures and risks and that those Governments in a position to do so provide educational, technical and other forms of assistance to facilitate broad participation by countries regardless of their economic or technical advancement.

III - 231 Governments provide information to the Secretary-General concerning their experiences with pollution control activities, including legislative and administrative arrangements, technology, cost-benefit methodology, and that the Secretary-General make this information available to those who desire to benefit from the experience of others.

III - 234 Governments:

(a) - support national research and monitoring efforts that contribute to agreed international programmes for research and monitoring in the marine environment, in particular GIPME and IGOSS;

(b) - register the discharge of significant quantities of radioactive materials to the oceans with IAEA/WHO, as well as co-operate with IAEA in the expansion of this registry to include all discharge of significant quantities of radioactive materials into the biosphere;

(c) - provide to the United Nations, FAO and UNCTAD, as appropriate to the data-gathering activities of each, statistics on the production and use of toxic and persistent materials;

(d) - expand their support to components of the United Nations system concerned with research and monitoring in the marine environment, especially IOC in order that it can take on additional responsibilities for promotion and co-ordination of scientific services.

(iii) Monitoring

(a) REFERRED TO GOVERNMENTS FOR THEIR CONSIDERATION AND SUCH ACTION AS THEY DEEM APPROPRIATE:

II - 35 Governments should conduct selective base-line surveys of agricultural areas where basic agricultural resources are known or suspected to be suffering environmental degradations.

II - 36 Governments should keep systematic records of environmental problems caused by or affecting agriculture using the above base-line surveys.

II - 127 Surveys and monitoring activities should be developed (for fisheries).

II - 130 Fisheries institutions should be adequately supported to undertake required environmental and biological research and to provide necessary data on catches, state of resources and fisheries activities and make periodic assessment of fish stocks.

II - 152 Governments should undertake, where necessary, comprehensive surveys of water resources and water demands.

II - 171 Governments should establish base-lines of natural activity and monitor changes in actual and potential mining areas so that the impact of mining can be measured - and eventually predicted..

IV - 110 The strengthening and co-ordination of action in progress with regard to the institutional organization of environmental monitoring from the social and cultural standpoint; the selection of social and cultural indicators of the environment;

V - 29 (Governments of the less industrialized countries) ... give priority to conducting surveys of the present state of the environment and of the major hazards to which it is likely to be exposed in the process of development, to help determine the extent to which environment is affected by mass poverty, malnutrition, housing shortage, inadequate water supply, disease and illiteracy, and using these studies and surveys in the formulation of social and economic plans; reviewing existing legislation available to implement national environmental policies and objectives, and determining what new legislative actions are necessary in light of this review; and analysing studies and experience of other countries which are developing environmental programmes and policies and are applying new administrative and technological approaches to pollution control.

### (b) ACTIVITIES BY GOVERNMENTS CALLED FOR IN CONNEXION WITH RECOMMENDATIONS FOR INTERNATIONAL ACTION, FOR FURTHER CONSIDERATION BY THE CONFERENCE:

It is recommended that:

II - 108 Governments ... make inventories of genetic resources most endangered by depletion or extinction.

II - 119 Governments ... collaborate to establish a global network of national and regional institutes for conservation of genetic resources based on agreements on the availability of material and information, on methods, on technical standards, and on the need for technical and financial assistance wherever required.

II - 207 ... Governments take the necessary steps to develop further remote sensing techniques in order to implement resources surveys and to ensure that the use of remote sensing devices be shared, where appropriate.

III - 222 Governments actively support and contribute to international programmes to acquire knowledge for the assessment of pollutant sources, pathways, exposures and risks and that those Governments in a position to do so provide educational, technical and other forms of assistance to facilitate broad participation by countries regardless of their economic or technical advancement.

III - Governments:
234

(a) - support national research and monitoring efforts that contribute to agreed international programmes for research and monitoring in the marine environment, in particular GIPME and IGOSS;

(b) - register the discharge of significant quantities of radioactive materials to the oceans with IAEA/WHO, as well as co-operate with IAEA in the expansion of this registry to include all discharge of significant quantities of radioactive materials into the biosphere;

(c) - provide to the United Nations, FAO and UNCTAD, as appropriate to the data-gathering activities of each, statistics on the production and use of toxic and persistent materials;

(d) - expand their support to components of the United Nations system concerned with research and monitoring in the marine environment, especially IOC, in order that it can take on additional responsibilities for promotion and co-ordination of scientific services.

(iv) Information Exchange

(a) REFERRED TO GOVERNMENTS FOR THEIR CONSIDERATION AND SUCH ACTION AS THEY DEEM APPROPRIATE:

II - Governments should develop and facilitate information exchange and transfer of
39 experience in agriculture within an ecological framework.

II - The exchange of information relating to aquaculture, introducing of exotic
130 species, as well as the exchange of expertise in these fields should be fostered.

II - Governments should engage in the acquisition of new knowledge (concerning water
156 resources) and co-operate in the transfer of existing knowledge, as priorities indicate.

IV - Action to develop and strengthen existing information networks concerned with
128 environmental problems.

(b) ACTIVITIES BY GOVERNMENTS CALLED FOR IN CONNEXION WITH RECOMMENDATIONS FOR INTERNATIONAL ACTION, FOR FURTHER CONSIDERATION BY THE CONFERENCE:

It is recommended that:

I - Governments consider co-operative arrangements to undertake the necessary
141 research whenever the above problem areas have a specific regional impact. In such cases, provision should be made for the exchange of information and research findings with countries of other geographical regions sharing similar problems.

I - 144 Governments take steps to arrange for the exchange of visits by those who are conducting research in the public or private institutions of their countries.

I - 144 Governments ... ensure that the exchange of information concerning past and on-going research, experimentation and project implementation covering all aspects of human settlements, which is conducted by the United Nations system or by public or private entities including academic institutions, be accelerated.

II - 119 Governments collaborate to establish a global network of national and regional institutes (of genetic resources) based on agreements on the availability of material and information, on methods, on technical standards, and on the need for technical and financial and assistance wherever required.

III - 131 Governments provide information to the Secretary-General concerning their experiences with pollution control activities, including legislative and administrative arrangements, technology, cost-benefit methodology, and that the Secretary-General make this information available to those who desire to benefit from the experience of others.

(v) Comprehensive programme to reduce losses from national disasters

(a) REFERRED TO GOVERNMENTS FOR THEIR CONSIDERATION AND SUCH ACTION AS THEY DEEM APPROPRIATE:

I The need for action to improve the ability to determine where disasters are likely to occur and to communicate the relevant information to those concerned. More specifically:

- Improved knowledge of tectonics, seismicity and the earthquake mechanism could provide a scientific basis for predicting the time and location of single large earthquakes;
- Expanded use of mathematical modelling and numerical analysis could improve knowledge of tsunami (seismic tidal wave) build-up;
- A broad assessment is needed of the world flood problem. The primary need, especially in developing countries, is to define the regions which are most prone to flooding. Continued progress is required in developing models and techniques for gathering hydrological data;
- Improvements are needed in the ability to predict the occurrence of storms, typhoons and cyclones;
- Improvements are also needed in the ability to predict secondary disasters, such as major outbreaks of disease resulting from natural disasters.

The need for action in the following areas:

- the adoption of structural measures such as:
    - the development of improved building methods and "house types" for low-cost, earthquake-resistant, storm-surge and wind resistant, rapid-construction housing
    - flood control measures, such as detention reservoirs, levees, diversion channels, channel improvements, terracing, gully control, bank stabilization or revegetation, water shed management
- the adoption of non-structural measures such as:
    - planning measures and land-use zoning designed to guide the settlements of human populations away from hazardous areas
    - programmes of public information designed to show the nature of the hazard and of the required response
- the adoption of a comprehensive approach to natural disaster

    The evaluation by planning ministries and national planning boards of the full range of possible actions, combining technical with social and economic measures. As an example, programmes of diversion, or evacuation without adequate provision for resettlement, may fail to achieve any genuine improvement in living conditions.

The need for emergency action plans. These should specify:

- organisational responsibilities: who is to take charge of what
    - a role of armed forces or civil defence units
    - role of voluntary agencies
- lines of communication and command;
- availability of emergency supplies;
- type and amount of external aid likely to be required in different contingencies.

## (b) ACTIVITIES BY GOVERNMENTS CALLED FOR IN CONNEXION WITH RECOMMENDATIONS FOR INTERNATIONAL ACTION, FOR FURTHER CONSIDERATION BY THE CONFERENCE:

It is recommended that:

I - - 150 governments and the Secretary-General implement a plan of action designed to reduce losses from natural disasters including: the intensive application of science and technology to the control and mitigation of natural disasters; pre-disaster planning and preparedness; and the strengthening of international machinery, and of international co-operation, during and after the occurrence of natural disasters.

## B. Environmental Management

### (a) REFERRED TO GOVERNMENTS FOR THEIR CONSIDERATION AND SUCH ACTION AS THEY DEEM APPROPRIATE:

I - 134 (e) the allocation of greater financial and other resources to the housing sector so as to preserve what is valuable in the existing housing stock; launch, wherever possible, public housing projects; revitalize city centres; improve transitional settlements; promote mutual help and aided self-help; and provide, where appropriate "site and service" facilities to new migrants;

(f) the establishment of regional and sub-regional growth poles in order to revive and preserve rural settlements and to reduce mass migration to large urban centres;

(g) the development of appropriate mass media channels to strengthen the capacity of growth poles to revive and preserve rural settlements through vocational and motivational communications;

(h) the adoption and implementation of a dynamic policy of land use through appropriate incentives and controls designed to prevent land speculation, ensure the proper location of industries, provide security of tenure in transitional areas and restrict motor vehicle traffic;

(i) improving human environment; specifically, the development of city and intercity transport systems for environmental quality and the solution, by technical, legislative and administrative measures, of existing problems of traffic congestion and safety and of air, water and noise pollution from transport sources;

II - 34 Governments should develop agricultural plans and policies to enable farmers and agro-industries to fulfill their responsibilities in maintaining the quality of the human environment.

II - 41 Governments should introduce an institutional and legislative framework which accounts for the environmental dimensions of agricultural development.

II - 42 Governments should consider the needs to provide incentives and assistance to farmers and agro-industries.

II - 43 Governments should establish or strengthen national programmes of conservation of soil resources.

II - 44 Governments should consider the possibilities of recycling agricultural wastes.

II - 45 Governments should institute or reinforce national programmes to regulate the use of pesticides and other biocides and to develop integrated pest control.

II - 63 Governments should develop forest policies and planning as part of an overall policy for the rational and integrated use of natural resources.

II - Governments should design environmental forest management to meet the competing
64 demands on forest resources.

II - Governments should introduce minimum management plans where none currently exist
65 and governments already committed should increase their efforts.

II - Each country should establish regions of nature reserves and other protected
73 areas.

II - Countries should enact and enforce protective laws regulating the harvesting
74 and marketing of wild animals and their products, to guarantee that populations
are not exploited to a degree that would threaten their survival.

II - Governments should also exercise careful control over the introduction of exotic
75 species into new areas with a view to preventing the displacement of indigenous
species.

II - The consideration of wildlife resources and other habitat should be incorporated
77 into land use planning and development, particularly in respect to long range
considerations.

II - Facilities should be developed, particularly in the developing countries, to
78 attract and service tourism based on wildlife resources.

II - Governments, particularly those of the developing countries, should formulate
78a demonstration cropping and hunting programmes for large game animals with
substantial populations.

II - Governments should set aside wildland wherever possible.
91

II - Governments should accelerate the development of recreational facilities within
94 or near by urban areas.

II - Overall development policies and plans should take due account of the increasing
128 role of fisheries in world food supply and of their vulnerability to multiple
forms of damage by other development activities, particularly those affecting
productive coastal areas.

II - In order to further enlarge the protein harvest from the hydrosphere, the
129 productivity of the aquatic resources should be protected and enhanced.

II - Fisheries legislation and regulatory control institutions will need to be reviewed
130 and their effectiveness improved to cope with increasing demand for protecting
fisheries. The training of specialists for these fields will be necessary, as
will the provision of adequate resources and facilities.

II - Governments should formulate and adopt integrated water resources policies.
153

II - Governments should give special attention to pollution control and other
154 environmental aspects of water resources management.

II - Governments should encourage the increased efficiency of water use in agriculture
155 and in industry.

II - Countries should adopt the view that most mineral exploration and production are
167 parts of a series of sequential land uses. This view should be integrated with other aspects of the country's natural resource management plans.

II - Each country should develop firm policies appropriate to its goals and
168 environmental concerns.

II - Countries should develop land-use regulations that will permit mineral
169 extraction, and subsequent mined-land reclamation, prior to the advent of other economic activities that would preclude mining, except for those cases where mining would destroy other resources deemed to be of greater aesthetic, cultural or economic value.

II - Each nation should vest its proposed land use agency with the authority to
170 implement the preceding recommendations.

II - Countries should adopt the standard of no new incidence of advanced cases of
172 occupational lung disease and set up systems for early diagnosis of the disease.

II - Countries should adopt reclamation standards and regulations to the effect that
173 all exploration activity and all mining be completed in such ways that there are no continuing damages.

II - Nations should study means to increase the recycling of mineral-based products
174 and, wherever justified by a consideration of the comparative costs, encourage recycling processes.

II - Each nation should set up a national energy board to co-ordinate energy
189 development and utilization policies, staffed with highly qualified personnel, including some in those disciplines relating to the adverse environmental effects of energy.

II - Those governments with high per capita use should consider the opportunities for
190 reducing the growth of energy consumption as one of the alternatives in minimizing all of the costs - direct, environmental and cultural - from economic development.

II - Countries should also develop explicit transportation policies and integrate these
191 with considerations developed above.

II - Countries should devote special attention to minimizing environmental impacts
193 when siting energy production, conversion and transportation facilities.

II - 195 Despite best efforts, a finite probability of accidents must remain. For this reason, each nation may wish to set up a pollution crisis centre to deal with accidents.

IV - 123 The reflection, in social and economic policies, of concern for conservation, in particular of the most valuable features of the environment anywhere in their territory (monuments, sites, rural and urban landscapes, interesting ecological settings, threatened species of fauna and flora, high-quality resources of water and open space, etc.), with due attention to the possibility of signing various international conventions on conservation (enumerated below in the recommendations for international action);

- the launching or continuation of pilot schemes based on participation, and mainly:

  . the creation and progressive improvement of reception areas for large numbers of migrants from the countryside to major urban areas in the developing countries;

  . the creation of urban centres designed to meet human needs and to strengthen the development of a national culture which draws heavily on the past and on innovation;

  . a completely new approach to the tourist trade, based on developing it for the real benefit of the local population, on respect for and discovery of the local culture by visitors, and on due attention to ecological data.

V - 23 Development policies should include a selective attack on the worst manifestations of poverty. Development goals and targets should be expressed in terms of a progressive reduction and eventual elimination of malnutrition, disease, illiteracy, squalor, unemployment and inequalities. While the GNP may serve as a convenient summation of all other targets, greater attention must be paid to its content and elements;

- Consumption targets which could be reached in a reasonable period of time should be set. Those targets should be expressed in terms clearly directed to achieving environmental conditions basic to human health and well being by eliminating the worst manifestations of poverty, such as nutritional, educational, health and housing deficiences. Environmental criteria should also be established for various sectors, such as health, nutrition, water supply, sanitation, soil conservation, land management, rural-urban interaction patterns, and the location and planning of new urban settlements;

- Appropriate machinery should be set up to deal with environmental problems and should be integrated, or closely linked with the machinery for overall development planning and implementation;

- Specific environmental goals should be incorporated in the process of regional and physical planning.

V - 27 Governments should take the initiative in establishing environmental guidelines and criteria for project appraisals; governments in formulating these guidelines, sho seek the assistance, if necessary, of outside agencies concerned with development, and that the guidelines be discussed at a later stage at the regional and international levels to achieve a broad consensus.

### (b) ACTIVITIES BY GOVERNMENTS CALLED FOR IN CONNEXION WITH RECOMMENDATIONS FOR INTERNATIONAL ACTION, FOR FURTHER CONSIDERATION BY THE CONFERENCE:

It is recommended that:

I - 137 Governments designate to the Secretary-General areas in which they have committed themselves (or are prepared to commit themselves) to a long-term programme of environmental improvement.

I - 138 The attention of governments be drawn to the need to consult bilaterally or regionally whenever environmental conditions or development plans in one country could have repercussions in one or more neighbouring countries.

II - 47 Governments ... strengthen and co-ordinate international programmes for integrated pest control and reduction of the harmful effects of agro-chemicals.

II - 84 Governments give attention to the need to enact international conventions and treaties to protect species inhabiting international waters or those which migrate from one country to another.

II - 85 Governments move to agree to the proposed convention on the export, import, and transit of certain species of wild animals and plants.

II - 86 Governments agree to strengthen the international whaling commission and to consider an international agreement calling for a 10-year moratorium on commercial whaling.

II - 99 (a) Take steps to co-ordinate and co-operate on the management of shared protected areas.

(b) Move to agree on the proposed conventions on conservation of certain islands for science, and conservation of the world heritage.

(c) Take steps to set aside areas representing ecosystems of international significance for protection under international agreement.

II - 99 Interested governments - which have not yet done so - sign and ratify the convention on conservation of wetlands of international importance, approved at the Conference of Ramsar (Iran).

II - Governments ... agree to an international programme to preserve the world genetic
107 resources. Active participation at the national and international levels is involved in six inter-related areas: survey of genetic resources; inventory of collections; exploration and collecting; documentation; evaluation and utilization; and conservation.

II - Governments ... recognize that conservation is a most crucial part of any
111 programme of genetic resources.

II - Governments ... organize and equip national or regional (plant) genetic resources
112 conservation centres.

II - Governments ... maintain gene pools of wild plant species within their natural
113 communities.

II - Governments ... fully implement the programmes initiated by the FAO panels of
114 experts on forest gene resources in 1968 and on plant exploration and introduction in 1970.

II - Governments ... consider the desirability and feasibility of international action
115 to preserve breeds or varieties of animals.

II - Governments ... co-operatively establish and properly fund a few large regional
116 collections (of micro-organism germ plasm).

II - Governments ... establish conservation centres of insect germ plasm.
117

II - Governments ... act with the understanding that evaluation and utilization are
118 critical corollaries to the conservation of genetic resources.

II - Governments ... collaborate to establish a global network of national and
119 regional (genetic resource) institutes based on agreements on the availability of material and information, on methods, on technical standards, and on the need for technical and financial assistance wherever required.

II - Governments ... implement certain institutional innovations in order to answer
120 the need for liaison among the parties participating in the global system of genetic resources conservation.

II - Governments ... take steps to support recent guidelines recommendations and
131 programmes of the various international fishing organizations.

II - Governments ... take steps to ensure close participation of fishery agencies
132 and interests in the preparations for the UN Conference on the Law of the Sea.

II - Governments ... take steps to ensure international co-operation in the research,
133 control and regulation of the side effects of national activities in resource utilization where these affect the aquatic resources of other nations.

II - 135 Governments ... take steps to ensure full co-operation among governments by strengthening the existing international and regional machinery for development and management of fisheries and their related environmental aspects, and in those regions where these do not exist, encourage the establishing of fishery councils and commissions as appropriate.

II - 159 ... Governments concerned consider the creation of appropriate multinational institutions in the form of international river-basin commissions, for water resources common to more than one jurisdiction.

II - 201 ... Governments concerned provide that pilot studies be conducted in representative ecosystems of international significance to assess the environmental impact of alternative approaches to the survey, planning, and development of resource projects.

III - 218 Governments be especially mindful of activities in which there is an appreciable risk of effect on climate, and,

1) - carefully evaluate the likelihood and magnitude of climatic effects and disseminate their findings before embarking on such activities.

2) - consult fully other interested States when activities carrying a risk of such effects are being contemplated or implemented.

III - 219 Governments use the best practicable means available to minimize the release to the environment of persistent and toxic substances, particularly heavy metals and organochlorine compounds, until it has been demonstrated that their release will not cause adverse effects or unless their use is essential to human health or food production, in which case appropriate control measures should be applied.

III - 220 Governments take into account, in establishing standards for pollutants of international significance, the relevant standards proposed by competent international organizations, and concert with other concerned governments and the competent international organization in planning and carrying out control programmes for pollutants distributed beyond the national jurisdiction from which they are released.

III - 221 Governments avoid creating barriers to international trade to off-set the costs of pollution control and that they consult with other concerned governments, even though there may be no legal obligation to do so, with a view to avoiding the creation of non-tariff barriers due to variations in national standards for goods or for the transport or use of goods.

III - 231 Governments provide information to the Secretary-General concerning their experiences with pollution control activities, including legislative and administrative arrangements, technology, cost-benefit methodology, and that the Secretary-General make this information available to those who desire to benefit from the experience of others.

III - Governments:
233

- accept and implement existing instruments on the control of the maritime sources of marine pollution;

- ensure that the provisions of existing instruments are complied with by ships flying their flags and that adequate provisions are made for reviewing the effectiveness of, and revising, existing and proposed international measures for control of marine pollution;

- ensure that ocean dumping by their nationals is controlled and complete and bring into force as soon as possible an over-all instrument for the control of ocean dumping, as well as needed regional agreements within the framework of this instrument;

- participate fully in the 1973 IMCO Conference on Marine Pollution and the Law of the Sea Conference scheduled to begin in 1973, as well as in regional efforts, with a view to bringing all significant sources of pollution within the marine environment under appropriate controls;

- strengthen national controls over land-based sources of marine pollution.

III - Governments collectively endorse the principles set forth in paragraph 197 as
239 guiding concepts representing a basis for general agreement, in particular at the 1973 IMCO Conference on Marine Pollution and at the Law of the Sea Conference scheduled to begin in 1973.

IV - Governments ... continue the preparation of the conventions required for the
124 conservation of the world's natural resources and cultural heritage (monuments, groups of buildings and sites; wetlands of international importance; island ecosystems still undisturbed by human activities; species of wild animals and plants, etc).

IV - Governments make arrangements to examine with a view to signature the following
125 draft conventions - if they are already open or are hereafter opened for signature: draft convention on conservation of the world heritage; draft convention on the protection of monuments, groups of buildings and sites; draft convention on conservation of wetlands of international importance; draft convention on conservation of certain islands for science; and draft convention on export, import and transit of certain species of wild animals and plants.

V - Governments take the necessary steps to ensure that:
32

- all countries present at the Conference agree not to invoke environmental concerns as a pretext for discriminatory trade policies or for reduced access to markets and recognize further that the burdens of the environmental policies of the developed countries should not be transferred, either directly or indirectly, to the developing countries;

- where environmental concerns lead to restrictions on trade, or stricter environmental standards with negative effects on exports, particularly from developing countries, appropriate measures for compensation should be worked out;

- the GATT could be used for the examination of the problems, specifically through the recently established Group on Environmental Measures and International Trade and through its general procedures for bilatoral and multilateral adjustment of differences;

- whenever possible (i.e. in cases which do not require immediate discontinuation of imports), countries should inform their trading partners in advance about the intended action in order that there might be an opportunity to consult within the GATT Group on Environmental Measures and International Trade. Assistance in meeting consequences of stricter environmental standards ought to be given in the form of financial or technical assistance for research with the aim to remove the obstacles that the products of developing countries have encountered;

- all countries agree that uniform environmental standards should not be expected to be applied universally by all countries with respect to given industrial processes or products except in those cases where environmental disruption may constitute a concern to other countries. Environmental standards should be established at whatever levels are necessary, to safeguard the environment and should not be aimed at gaining trade advantages.

V - 36 Governments of the developing countries consider fully the new opportunities which may be offered to establish industries in which they may have comparative advantages due to environmental considerations, and that special care be taken in all such instances to avoid the creation of pollution problems in developing countries; and that the Secretary-General in consultation with appropriate international agencies, undertake a full review of the practical implications of environmental concerns in relation to distribution of future industrial capacity and in particular, to ways in which the developing countries may be assisted to take advantage of opportunities and to minimize risks in this area.

## C. Supporting Measures

### (i) Education and Training and Public Information

(a) REFERRED TO GOVERNMENTS FOR THEIR CONSIDERATION AND SUCH ACTION AS THEY DEEM APPROPRIATE:

I - 134 (j) the provision of educational and recreational facilities for youth of the poorer urban and rural areas;

(k) the mobilization of public support for the comprehensive environmental development of human settlements and to achieve the highest possible degree of public participation in formulating and implementing policies.

II - 40 Governments should introduce environmental considerations into their programmes of agricultural education and training.

II - 93 Governments should educate their peoples on the value and purposes of protected areas and design means to use parks as an educational tool.

II - 130 ... related (fisheries) training facilities should be established or strengthened ...

... the training of specialists in these fields (fisheries legislation and regulatory control) will be necessary, as will the provision of adequate resources and facilities.

II - 157 Governments should support formal and short-term training courses essential to the development of effective water management programmes.

IV - 113 -

- at the school level, a thorough revision of curricular to adapt them to modern methods of teaching. Besides introducing new material into certain subjects more particularly concerned with the environment (natural sciences, physical and human geography), it will be necessary to encourage an ecological approach: i.e. to forge inter-disciplinary links between the various subjects taught and, in particular, to use active and integrated methods of teaching - field excursions, open-air centres, country classes for town children, simulation of cases based on local examples, audio-visual aids, etc. - calculated to prepare the students for participation. These experiments in teaching should not neglect the pre-school level. For the training of intermediate-level technicians, training institutions will have to be established or adapted to suit the widely varying needs of different countries;

- at the university level, intensification of the training of specialists in the basic disciplines of environmental management and of administrators specializing in the management of pluridisciplinary systems, after a careful survey of requirements and possible markets for their services. The appropriate university courses should be instituted or brought up to date in order to deal with current problems. As to the administrators specializing in the management of pluridisciplinary systems, it may be thought appropriate that people already qualified in a suitable basic discipline should be professionally trained to take charge of teams for the study and management of systems of interdependent activities concerned with the environment, such as the integrated development of an urban complex, the development of a river basin or the integrated study of a region's potentialities;

- adaptation of the training for the members of all professions involved in environmental planning:

    . firstly, professional people who act directly upon the environment, such as engineers, architects, town and physical planners. It would be necessary to introduce into the existing curricula of training for these professions a set of general notions on the main problems of the environment, together with advanced training in the environmental management techniques associated with each of the professions concerned;

  . secondly, professional people such as economists, administrators, planners, political leaders and trade union officials, whose functions involve them in indirect action upon the environment. These should be given a general training through seminars or suitable ad hoc courses;

- arrangements for permanent training for the members of all the professions mentioned, in view of the very rapid evolution of environmental problems and knowledge;

- intensification of extra-mural educational activities relating to environmental management, particularly for rural populations who live by agriculture, animal husbandry and forestry and who thus have a large proportion of biological resources under their management;

- adaptation of the training of teachers, at all levels, and community leaders to equip them for their duties as redefined in the foregoing proposals.

II - 118 - participation in maintaining the flow of information on the environment by all available means (dissemination of the main data collected by public authorities in the form of national reports; local and national campaigns, etc.) and the use of the mass media to educate the public, particularly the rural population, on these subjects;

- the establishment of information machinery and machinery for the co-ordination of public responsibilities for education, training and information;

- increased public participation in the main channels of mass information;

- active encouragement of community activities favourable to the creation of a "good environment", particularly youth activities (in specialized or non-specialized associations, out-of-school establishments, etc.), by providing continuous material support and adequate facilities (e.g. open-air centres with trained staff);

- adaptation and operation of public agencies responsible for environmental management so as to provide for greater participation, and to that end reform, if necessary, of the structure of urban and rural local government.

### (b) ACTIVITIES BY GOVERNMENTS CALLED FOR IN CONNEXION WITH RECOMMENDATIONS FOR INTERNATIONAL ACTION, FOR FURTHER CONSIDERATION BY THE CONFERENCE:

It is recommended that:

I - 146 - Governments ... give urgent training of "integrators".

I - 148 Governments ... ensure that the institutions concerned be strengthened and that special training activities be established for the benefit of the less-industrialized countries, covering the following:

. intermediate and auxiliary personnel for national public services who, in turn, would be in a position to train others for similar tasks - (principal responsible bodies: WHO, ESA (CHBP), UNIDO, FAO)

. specialists in environmental planning and in rural development - (principal responsible bodies: ESA (CHBP), FAO)

. community developers for self-help programmes for low-income groups - (principal responsible body: ESA (CHBP))

. specialists in working environments - (principal responsible bodies: ILO, ESA (CHBP), WHO)

. planners and organizers of mass transport systems and services with special reference to environmental development - (principal responsible body: ESA - Resources and Transport Division).

II - 95 Governments ... give special attention to training requirements of national parks and other protected areas.

III - 222 Governments actively support and contribute to international programmes to acquire knowledge for the assessment of pollutant sources, pathways, exposures and risks and that those Governments in a position to do so provide educational, technical and other forms of assistance to facilitate broad participation by countries regardless of their economic or technical advancement.

(ii) Organization and Financing

(a) REFERRED TO GOVERNMENTS FOR THEIR CONSIDERATION AND SUCH ACTION AS THEY DEEM APPROPRIATE:

I - 134 (b) the improvement of existing - or the establishment of new - legislative and institutional frameworks to render (a comprehensive environmental development) approach (to policy-making and implementation in the field of human settlements) effective.

IV - 118 - the establishment of information machinery and machinery for the co-ordination of public responsibilities for education, training and information.

- active encouragement of community activities favourable to the creation of a "good environment", particularly youth activities (in specialized or non-specialized associations, out-of-school establishments, etc.), by providing continuous material support and adequate facilities (e.g. open-air centres with trained staff).

- adaptation and operation of public agencies responsible for environmental management so as to provide for greater participation, and to that end reform, if necessary, of the structure of urban and rural local government.

IV – 123 – the launching or continuation of pilot schemes based on participation, and mainly:

. the creation and progressive improvement of reception areas for large numbers of migrants from the countryside to major urban areas in the developing countries;

. the creation of urban centres designed to meet human needs and to strengthen the development of a national culture which draws heavily on the past and on innovation;

. a completely new approach to the tourist trade, based on developing it for the real benefit of the local population, on respect for and discovery of the local culture by visitors, and on due attention to ecological data.

### (b) ACTIVITIES BY GOVERNMENTS CALLED FOR IN CONNEXION WITH RECOMMENDATIONS FOR INTERNATIONAL ACTION, FOR FURTHER CONSIDERATION BY THE CONFERENCE:

It is recommended that:

I – 137 – Countries which are prepared to launch such a programme of environmental improvement should be prepared to make long-term commitments of financial and other resources.

I – 148 – Governments ... ensure that the institutions concerned be strengthened and that special training activities be established for the benefit of the less-industrialized countries.

II – 86 – Governments agree to strengthen the International Whaling Commission and to consider an international agreement calling for a 10-year moratorium on commercial whaling.

II – 112 – Governments ... organize and equip national or regional genetic resources conservation centres.

II – 116 – Governments ... co-operatively establish and properly fund a few large regional collections (of micro-organism germ plasm).

II – 117 – Governments ... establish conservation centres of insect germ plasm.

II – 119 – Governments ... collaborate to establish a global network of national and regional institutes for genetic resources based on agreements on the availability of material and information, on methods, on technical standards, and on the need for technical and financial assistance wherever required.

II - Governments ... implement certain institutional innovations in order to answer
120 the need for liaison among the parties participating in the global system of genetic resources conservation.

III - Governments actively support and contribute to international programmes to
222 acquire knowledge for the assessment of pollutant sources, pathways, exposures and risks and that those Governments in a position to do so provide educational, technical and other forms of assistance to facilitate broad participation by countries regardless of their economic or technical advancement.

## III. HOW RECOMMENDED ACTIONS ADDRESS NEEDS

The recommendations to be considered for the Action Plan must be viewed in their relationships to the concerns to which they are directed and to the long-term objectives they are designed to serve. They must also be considered in relation to the national actions focused on those concerns.

The objectives of what follows are to show the major areas of concern identified by analysis of the inputs to the Conference, the specific needs which require action if these concerns are to be satisfied, and the way recommendations that have been put before the Conference relate to these specific needs.

The major areas of concern are:

1. Improvement of human settlements and health:

   - creation of decent habitats for rapidly growing population;
   - protection of human health.

2. Development and use of fresh water, land, and energy resources:

   - availability of water for human use;
   - maintaining soil fertility;
   - management of forest and mineral resources;
   - reconciling energy demands and environmental concerns.

3. Harmonizing development goals and social and cultural values with environmental quality objectives:

   - relationship between development goals and environment;
   - relationship of social and cultural values and environment.

4. Protection of living resources and of the ocean and avoidance of inadvertent climate modification:

   - protection of terrestrial ecosystems, wildlife, genetic resources, and fisheries;
   - protection of the ocean;
   - man's impact on climate.

In the material presented below, each of the above areas of concern is followed by a number of specific needs which were identified in the course of preparing the action plan. For each need, there are corresponding numbers of the recommendations that address the need.

The recommendations cited in this part are those that are specifically cited in the Conference documentation as international recommendations to be considered for adoption by the Conference or as national recommendations for referral to the attention of governments. The distinction between international and national recommendations for action is noted.

## AREA OF CONCERN 1. IMPROVEMENT OF HUMAN SETTLEMENTS AND HEALTH:

### (a) Creation of decent habitats for rapidly growing populations

| Needs | Actions Recommendation |
|---|---|
| 1. A comprehensive environmental development approach to the planning and management of human settlements should be adopted. | I-134a<br>I-137*<br>I-138*<br>V-23 |
| 2. Comprehensive human settlement policy making should be supported by appropriate research and education programmes as well as legal and institutional arrangements. | I-134b<br>I-134g<br>I-134k<br>I-140*<br>I-141*<br>I-144*<br>I-146*<br>I-148*<br>I-149* |
| 3. Population growth and distribution issues should be carefully considered in the development of urban, transitional, and rural settlements. | I-134c<br>I-134e<br>I-134f<br>I-134g<br>I-140*<br>I-154* |
| 4. Industrial planning should consider both the impact of industry on the environment, and the working conditions of the employees. | I-134h<br>I-148* |
| 5. Decent housing should be made available for everyone. | I-134e<br>I-136* |
| 6. Transportation systems should be developed to meet growing urban needs, and the need to combat pollution and noise. | I-134i<br>I-136*<br>I-140*<br>I-148* |
| 7. The shortages of adequate supplies of safe water and of sanitary and sewer services should be alleviated. | I-134d<br>I-136*<br>I-140*<br>I-152*<br>I-153* |

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* Denotes recommendations for international action. Recommendations without * are for referral to the attention of national governments for such action as they deem appropriate.

| Needs | Actions |
|---|---|
| | Recommendation |
| 8. Monitoring, assessment and control programmes should be developed to assure air quality in urban and regional areas. | I-134i<br>III-222*<br>III-225*<br>III-227*<br>III-230*<br>III-231* |
| 9. Adequate facilities should be provided for leisure and education. | I-134j<br>I-148*<br>II-93<br>II-94<br>IV-123<br>IV-124<br>IV-125* |
| 10. An early warning system and procedures need to be developed to minimize losses of life and property through natural disasters. | I-150*<br>III-227*<br>III-234a*<br>III-238* |
| (b) Protection of human health | |
| 1. The short- and long-term health effects of new chemicals and other environmental agents should be determined and mitigated. | II-172<br>III-223*<br>III-224*<br>III-236(b,c)* |
| 2. The release of harmful substances into the environment should be reduced and controlled. | III-219*<br>III-220*<br>III-230*<br>III-231*<br>III-232* |
| 3. The quality of food should be effectively monitored and controlled at both national and international levels, and early warnings issued of significant rises in contamination levels. | III-223*<br>III-226*<br>III-229*<br>III-232* |

## AREA OF CONCERN 2. DEVELOPMENT AND USE OF FRESH WATER, LAND, AND ENERGY RESOURCES

### (a) Availability of water for human use

| Needs | Actions<br>Recommendation |
|---|---|
| 1. Water resource surveys should be conducted to determine the supplies and the present and future demands for water. ........................ | II-152<br>II-207* |
| 2. Integrated planning and management policies should be developed for the conservation and use of all water resources. ................................ | II-153<br>II-154<br>II-156<br>II-157<br>II-158<br>II-160(a-c)* |
| 3. Assessment and control programmes should be developed to assure water quality. ................................ | II-160d*<br>III-219*<br>III-220*<br>III-225*<br>III-228*<br>III-230*<br>III-231* |
| 4. Integrated water resource management plans should be implemented. .......................... | II-151<br>II-153<br>II-154 |
| 5. The shortages of adequate supplies of safe water and of sanitary and sewer services should be alleviated. ............................ | I-134d<br>I-136*<br>I-140*<br>I-152*<br>I-153*<br>V-23 |
| 6. Water resources should be used more efficiently in agriculture. ............................ | II-155 |
| 7. Environmental aspects of river basin development should be carefully considered ........................... | II-159*<br>II-160a* |

### (b) Maintaining soil fertility

| Needs | Actions<br>Recommendation |
|---|---|
| 1. Selected surveys should be undertaken to determine areas with present or potential soil degradation. ......................... | II-35<br>II-36<br>II-201*<br>II-207* |

| Needs | Actions<br>Recommendation |
|---|---|
| 2. Research should be undertaken to determine ecologically sound soil management techniques, and information should be exchanged. | II-37<br>II-38<br>II-39<br>II-46<br>II-204*<br>II-227b*<br>III-228* |
| 3. Soil and water conservation measures should be taken to reduce the negative impacts of agricultural practices, particularly those related to intensive agriculture. | II-34<br>II-40<br>II-41<br>II-42<br>II-43<br>II-47*<br>II-48*<br>V-23 |
| 4. Measures should be adopted to minimize soil degradation from non-agricultural activities such as discharges of wastes; various uses, and mining policies. | II-167<br>II-169<br>II-170<br>II-173<br>II-193<br>III-219*<br>III-231* |

(c) Management of forest and mineral resources

| Needs | Actions<br>Recommendation |
|---|---|
| 1. Surveys of the world's forest resources and cover should be undertaken on a periodic basis | II-66b<br>II-201*<br>II-207*<br>III-228* |
| 2. Forest management should provide for the maintenance of both the productive capacity and the protective role of forests, especially in the tropics. | II-62<br>II-63<br>II-64<br>II-65<br>II-66*<br>II-67*<br>II-80<br>V-23 |
| 3. The adverse effects of forest management practices on the environment should be minimized. | II-63<br>II-64<br>II-65 |

| Needs | Actions |
|---|---|
| | Recommendation |
| 4. The impacts of mining and mineral processing activities on the environment should be minimized. | II-167<br>II-168<br>II-169<br>II-170<br>II-171<br>II-173<br>II-175*<br>III-219*<br>III-220*<br>III-236(a)* |
| 5. Methods should be adopted to reduce the wasteful use of minerals. | II-174<br>II-203c* |

(d) Reconciling energy demands and environmental concerns

| Needs | Actions |
|---|---|
| 1. Planning and management of energy activities should consider multiple choices with respect to such issues as energy conversion processes, and power plant siting in order to minimize the impact on the environment. | II-189<br>II-192<br>II-193<br>II-196*<br>III-219*<br>III-222*<br>III-231* |
| 2. The objective of slowing the rate of increase of energy-consumption should be considered in some areas. | II-189<br>II-190 |
| 3. Energy and environmental considerations should be included in the development of transportation systems. | I-134i<br>II-189<br>II-191 |
| 4. Accidents related to energy transport and production should be avoided and their impacts minimized. | II-194<br>II-195<br>III-233* |

## AREA OF CONCERN No. 3. HARMONIZING DEVELOPMENT GOALS AND SOCIAL AND CULTURAL VALUES WITH ENVIRONMENT QUALITY OBJECTIVES:

(a) Relationships between development goals and environment.

| Needs | Actions |
|---|---|
| | Recommendation |
| 1. Environmental goals should become integral parts of multiple dimensions of development strategy and priorities should be established in a manner that reinforces the development process. | V-23<br>V-40* |

| Needs | Actions<br>Recommendation |
|---|---|
| 2. Knowledge in environmental areas should br broadened for development planning especially with respect to social and cultural factors | V-29<br>V-31* |
| 3. Development projects should minimize environmental impacts. | V-27 |
| 4. Environmental problems that beset poor countries should be given particular attention, especially mass poverty. | V-23 |
| 5. Developing countries should be assisted in evaluating and obtaining technologies for protecting and improving the environment. | III-231*<br>III-236(d)*<br>V-39* |
| 6. New opportunities for developing countries created by world-wide environmental concern should be explored. | II-203c*<br>V-36*<br>V-39* |
| 7. International understanding should be reached on the economic implications of environmental concerns on trade. | III-221*<br>V-32*<br>V-33*<br>V-34* |
| 8. Environmental implications should be explicitly considered in development projects, and appropriate guidelines formulated. | I-136<br>II-203b*<br>IV-120<br>V-27 |
| 9. Regional co-operation should be reinforced in order to help developing countries in their environmental policies. | V-31* |
| 10. Principles of national and international responsibility in financing international environmental action should be established. | V-38* |

(b) Relationship of social and cultural values and environment.

| | |
|---|---|
| 1. The main principles of an environmental ethic should be established. | Declaration on the human environment. |

| Needs | Actions<br>Recommendation |
|---|---|
| 2. Research should be conducted on man-environment relations and of social relationships in man's physical surroundings. | I-140*<br>IV-110e |
| 3. Periodic national, regional and international reports on the state of and outlook for the environment should be prepared. | IV-110<br>IV-111* |
| 4. More effective information exchange, including that on social and cultural aspects of environmental problems should be established. | IV-111*<br>IV-114*<br>IV-128*<br>IV-137* |
| 5. The results of social research should be used in environmental planning. | IV-110 |
| 6. The public should be well informed and encouraged to participate in making environmental management decisions. | IV-118<br>IV-119* |
| 7. Education and training at all levels should treat explicitly the relationships between the physical and social factors of the environment. | II-93<br>IV-113<br>IV-114*<br>IV-115*<br>IV-116* |
| 8. The biological and cultural heritage of man should be protected. | II-91<br>II-92<br>II-95*<br>II-96*<br>II-97*<br>II-98<br>III-219*<br>III-224*<br>IV-123<br>IV-124*<br>IV-125*<br>IV-126* |

## AREA OF CONCERN No. 4. PROTECTION OF LIVING RESOURCES AND THE OCEAN AND AVOIDANCE OF INADVERTENT CLIMATE MODIFICATION:

### (a) Protection of terrestrial ecosystems, wildlife, genetic resources, and fisheries

| Needs | Actions Recommendations |
|---|---|
| 1. Programmes should be promoted to learn about terrestrial ecosystems, the pollutants and practices that may impact on them, to determine the sources, reservoirs and effects of these pollutants using indicator species where appropriate, and to control such pollutants. | II-45<br>II-47*<br>II-62<br>II-64<br>II-81*<br>II-201b*<br>II-203d*<br>III-222*<br>III-223*<br>III-228*<br>III-232*<br>IV-125* |
| 2. The beauty and diversity of man's heritage should be preserved through the development and expansion of parks and protected areas, and the implementation of the measures required for their development. | II-73<br>II-91<br>II-92<br>II-94<br>II-95*<br>II-96*<br>II-98a*<br>II-99*<br>IV-123<br>IV-124*<br>IV-125* |
| 3. Wildlife should be managed as an important resource, with careful consideration and the necessary regulation for their maintenance and protection | II-73<br>II-74<br>II-75<br>II-76<br>II-77<br>II-78<br>II-79<br>II-80<br>II-81*<br>II-82*<br>II-83*<br>II-84*<br>II-85*<br>II-86*<br>IV-125* |

| Needs | Actions<br>Recommendation |
|---|---|
| 4. The widest possible diversity of plant and animal species should be maintained through the conservation of gene pools, and genetic resources should be developed | II-107*<br>II-108*<br>II-109*<br>II-110*<br>II-111*<br>II-112*<br>II-113*<br>II-114*<br>II-115*<br>II-116*<br>II-117*<br>II-118*<br>II-119*<br>II-120* |
| 5. The basic research, monitoring, and organizational efforts to support fisheries management should be strengthened. | II-126<br>II-127<br>II-130<br>II-132*<br>II-133*<br>II-134*<br>II-135*<br>III-235*<br>III-236*<br>III-238* |
| 6. Fishery resource management policies should direct attention to sustaining and enhancing a balanced productivity for ocean and inland waters. | II-128<br>II-129<br>II-131* |
| 7. International co-operative efforts in fisheries management policies should be strengthened. | II-131*<br>II-135* |
| (b) Protection of the ocean | |
| 1. Assessment of man's impact on oceans should be accelerated through selected research and monitoring of sources, routes, reservoirs, effects and amounts of pollutants. | II-160d*<br>II-203d*<br>III-225*<br>III-232*<br>III-234*<br>III-235*<br>III-236*<br>III-237*<br>III-238* |

| Needs | Actions |
|---|---|
| | Recommendation |
| 2. Information on marine pollution should be continuously updated and disseminated to the scientific and policy-making communities. | III-222*<br>III-235* |
| 3. Guidelines should be generated for control of all significant sources of marine pollution with special attention to land-based sources, and measures should be developed to reduce maritime sources, both from normal and accidental discharges. | III-232*<br>III-233*<br>III-239*<br>III-240* |
| (c) Man's impact on climate | |
| A better understanding of man's role in climate change should be obtained through research and modelling. | II-204*<br>III-218*<br>III-227*<br>III-234* |
| 2. Trends in climate change and those pollutants and practices through which man can influence climate should be carefully monitored and evaluated. | II-196(c)*<br>II-204*<br>III-218*<br>III-222*<br>III-227*<br>III-232* |

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# LIST OF ABBREVIATIONS

## Note by the Secretary-General

Attached to this note is a list of abbreviations used in the official Conference documents.

## Abbreviations used in official Conference documents

### I. Organizations and programmes

| | | |
|---|---|---|
| A | ACAST | United Nations Advisory Committee on the Application of Science and Technology to Development |
| | ACC | United Nations Administrative Committee on Co-ordination |
| | ACMRR | Advisory Committee on Marine Resources Research |
| | ACOMR | Advisory Committee on Oceanic Meteorological Research |
| C | CHBP | United Nations Department of Economic and Social Affairs, Centre for Housing, Building and Planning |
| | CIAP | Interamerican Committee of the Alliance for Progress |
| E | ECA | United Nations Economic Commission for Africa |
| | ECAFE | United Nations Economic Commission for Asia and the Far East |
| | ECE | United Nations Economic Commission for Europe |
| | ECLA | United Nations Economic Commission for Latin America |
| | ECOSOC | United Nations Economic and Social Council |
| | ENEA | European Nuclear Energy Agency |
| | ESA | United Nations Department for Economic and Social Affairs |
| | ESA/RTD | United Nations Department for Economic and Social Affairs, Resources and Transport Division |

| | | |
|---|---|---|
| F | FAO | Food and Agriculture Organization of the United Nations |
| G | GARP | Global Atmospheric Research Programme |
| | GATT | General Agreement on Tariffs and Trade |
| | GESAMP | Joint Group of Experts on the Scientific Aspects of Marine Pollution (IMCO/FAO/UNESCO/WMO/WHO/IAEA/UN) |
| | GIPME | Global Investigation of Pollution in the Marine Environment |
| I | IAEA | International Atomic Energy Agency |
| | IAMAP | International Association of Meteorology and Atmospheric Physics |
| | IARC | International Agency for Research on Cancer |
| | IATA | International Air Transport Association |
| | IBP | International Biological Programme |
| | IBRD | International Bank for Reconstruction and Development |
| | ICAO | International Civil Aviation Organization |
| | ICC | International Computing Centre |
| | ICE | International Centre for the Environment |
| | ICES | International Council for the Exploration of the Sea |
| | ICSPRO | Inter-Secretariat Committee on Scientific Problems Relating to Oceanography |
| | ICSU | International Council of Scientific Unions |
| | IGOSS | Integrated Global Ocean Station System |
| | IHD | International Hydrological De |
| | ILO | International Labour Organization |

| | | |
|---|---|---|
| | IMCO | Intergovernmental Maritime Consultative Organization |
| | IOC | Intergovernmental Oceanographic Commission |
| | ISSS | International Society of Soil Science |
| | ITU | International Telecommunication Union |
| | IUCN | International Union for Conservation of Nature and Natural Resources |
| | IUFRO | International Union of Forestry Research Organizations |
| | IVIC | Institute of Scientific Research, Caracas |
| | IWG | Intergovernmental Working Group |
| | IWP | Indicative World Plan |
| L | LEPOR | Long-term and Expanded Programme of Oceanic Exploration and Research |
| M | MAB | Man and the Biosphere Programme (UNESCO) |
| O | OECD | Organization for Economic Cooperation and Development |
| S | SCOPE | Scientific Committee on Problems of the Environment |
| | SCOR | Scientific Committee on Ocean Research |

| | | |
|---|---|---|
| U | UNCHE | United Nations Conference on the Human Environment |
| | UNCTAD | United Nations Conference on Trade and Development |
| | UNDP | United Nations Development Programme |
| | UNESCO | United Nations Educational, Scientific and Cultural Organization |
| | UNESOB | United Nations Economic and Social Office in Beirut |
| | UNFPA | United Nations Fund for Population Activities |
| | UNHCR | United Nations High Commissioner for Refugees |
| | UNICEF | United Nations Children's Fund |
| | UNIDO | United Nations Industrial Development Organization |
| | UNISIST | World Science Information System |
| | UNITAR | United Nations Institute for Training and Research |
| | UNRWA | United Nations Relief and Works Agency for Palestine Refugees |
| | UNSCEAR | United Nations Scientific Committee on the Effects of Atomic Radiation |
| W | WEI | World Environment Institute |
| | WFP | World Food Programme |
| | WHO | World Health Organization |
| | WMO | World Meteorological Organization |
| | WWW | World Weather Watch |

## II. Technical terms

| | | |
|---|---|---|
| A | ABS | Alkyl benzene sulfonate |
| | ADI | Acceptable daily intake |
| | AS | Alkyl sulfonate |
| B | BHC | Benzyl hexachloride |
| | BOD | Biochemical oxygen demand |
| | BP | Benzopyrene |
| C | C | Centigrade |
| | Cd | Cadmium |
| | CO | Carbon monoxide |
| | $CO_2$ | Carbon dioxide |
| D | DDT | Dichlor difenil threechloretan |
| G | GNP | Gross national product |
| H | Hg | Mercury |
| | $H_2S$ | Hydrogen sulphide |
| K | Kg | Kilogram |
| | Km | Milometre |
| L | LAS | Linear alkyl sulfonate |

| | | |
|---|---|---|
| M | Mg | Milligram |
| | MHz | Megaherz |
| | Mrad/year | Milli rad per year |
| N | Ng | Nanogram |
| | NO | Nitrogen oxide |
| | $NO_2$ | Nitrogen dioxide |
| | $NO_x$ | Oxides of nitrogen |
| O | $O_3$ | Ozone |
| P | PAH | Polycyclic aromatic hydrocarbons |
| | PAN | Peroxyacyl nitrates |
| | Pb | Lead |
| | PCB | Polychlorinated biphenyls |
| | p p m | Part per million |
| R | RIOS | River Inputs to Ocean Systems |
| S | $SO_2$ | Sulphur dioxide |
| | $SO_3$ | Sulphur anhydride |
| U | Ug | Microgram of substance |